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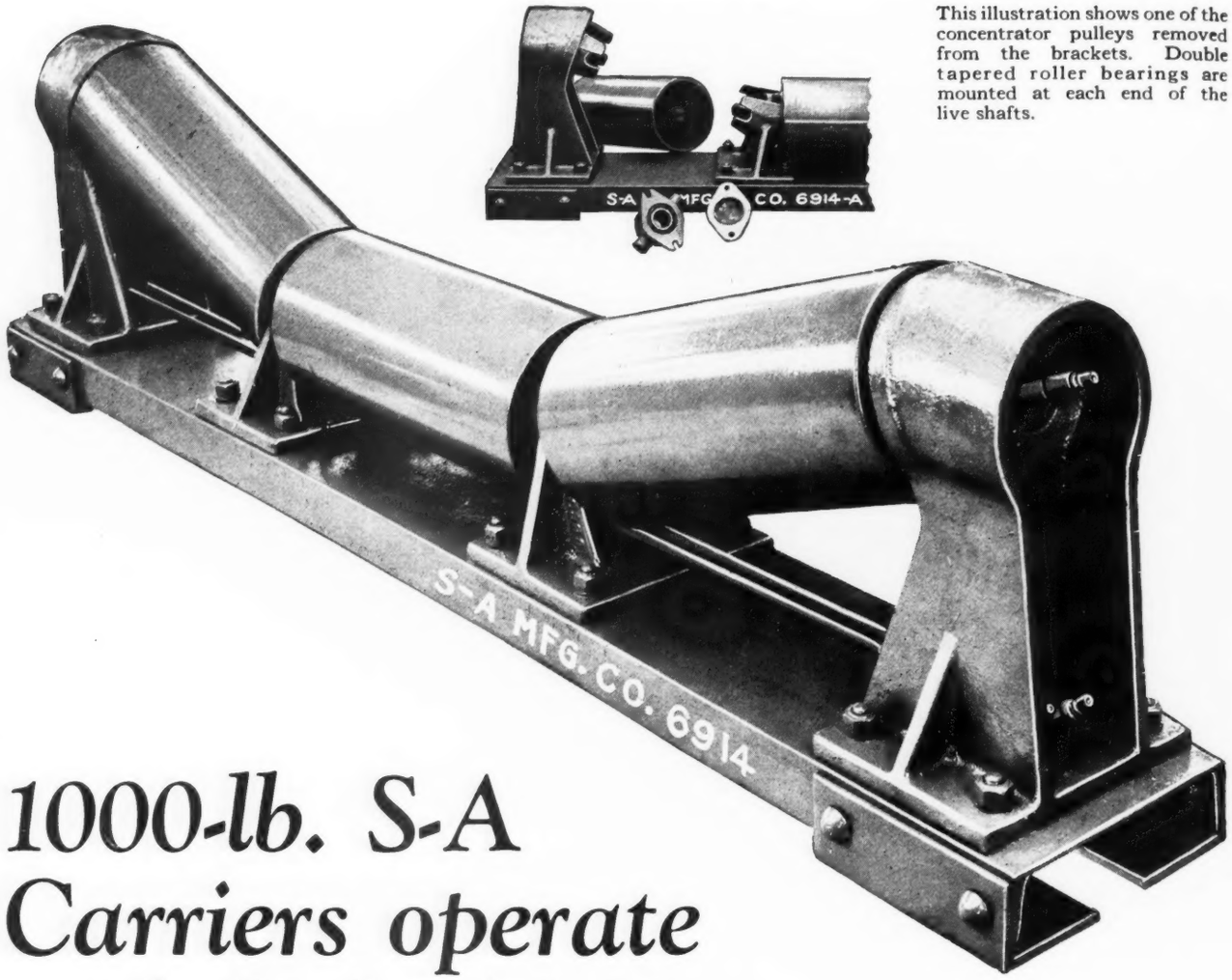
THE PLAZA, PACHUCA, MEXICO

Preservation of Mine Timber, by Dr. Friedrich Moll

Pouring 45,725 Yards of Concrete at Inspiration's Copper Leaching Plant, by George H. Booth

With the Geologists in Spain, by T. A. Rickard



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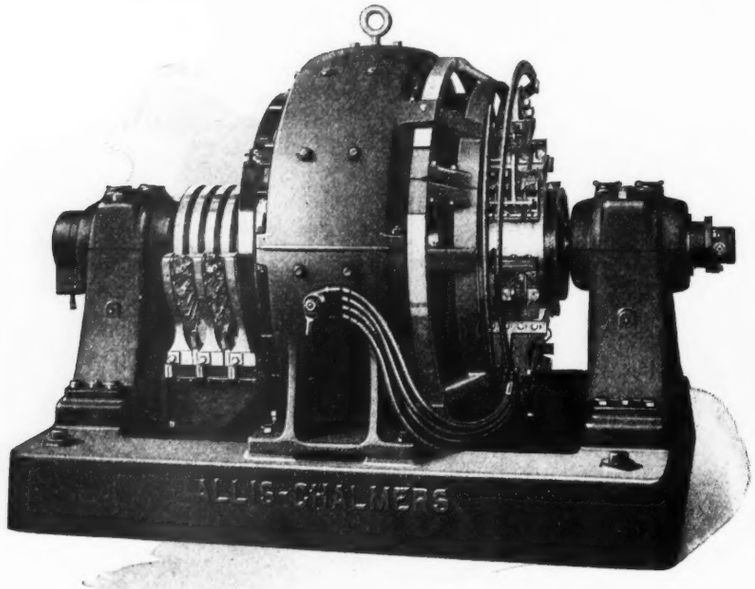

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ENGINEERING AND
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Manganese and the Tariff

FOLLOWING CLOSELY on the recent meeting of the A.I.M.E. in Cleveland that was called for the purpose of stimulating public interest in manganese, a Denver paper announced the discovery of a large body of high-grade manganese ore in Gunnison County, Colo. The coincidence invited skepticism—a shrewd promoter had seized the psychological moment, perhaps. Far from impossible, however, is such a discovery, and it is this possibility of finding new orebodies and new extensions of others already known that makes producers disinclined to accept as final the report of the Mining and Metallurgical Society's subcommittee on manganese, especially when this report is made the basis of a definite program for putting manganese on the free list.

In the report referred to it is estimated that even were the market price of manganese 50 per cent higher than the maximum reached during the war, there would be in the domestic reserve only about 1,400,000 tons of ore that could be classified as suitable for making ferromanganese and that could be mined profitably at the indicated price. Moreover, the rate of production would be an important factor, and the tonnage mentioned could not be produced rapidly enough to meet domestic needs. The best geological and engineering opinion obtainable seems to be, in short, that the domestic manganese resources of the United States in ores of ferro grade are utterly inadequate to meet the country's needs in peace or in war. Although new discoveries might be made at any time, some conceivably that might make the country independent of foreign ores, the fact remains that the present known reserve is small. If, then, this scant tonnage of high-grade ore were all the manganese that the United States had within its borders, the present tariff on manganese would be clearly unjustifiable as a protective tariff for the domestic industry. There is no sense in protecting infant industries that stand no chance of growing up.

But the story is different when domestic ores of lower than ferro grade are taken into consideration. These ores constitute the only source from which domestic manganese may be produced in sufficient quantities to meet any material trade demand, as was said in a recent "information circular" issued by the Department of Commerce. Of these, perhaps 35,000,000 tons would become commercial ore, according to the manganese subcommittee, under the same market conditions that would bring out the 1,400,000 tons of ore of ferro grade. It should be borne in mind, though, that this large tonnage would not all immediately become available as soon as the market rose to the price level at which it would become commercial. Time would be required to bring it into production. The committee estimates that 37 per cent of this 35,000,000 tons would average 16 per cent manganese and the balance 9.75 per cent. This represents an appreciable amount of manganese. Based on these ores it would seem that with adequate research and time a domestic manganese industry might be built.

Research would be the important factor in such a development. It is research that the committee urges in its report, at the same time that it urges that the duty be abolished. But how much research work is likely to be done if the existing domestic industry is destroyed through removal of the duty? Certainly private research and experiment will languish, having no material gain to hope for; and it is unlikely that governmental research would continue long under the circumstances. The steel industry, having foreign manganese duty free, would not be greatly interested. Too often in the past it has shown little interest in the government's efforts in its behalf.

When it is said that a price half again as high as the war-time maximum would be necessary to make the 35,000,000 tons of low-grade manganese ore commercial, it is taken for granted that this means with no more research than has been done thus far. Continued research, however, probably would show how this tonnage might be utilized at prices more nearly like those now prevailing. A domestic manganese industry, fostered by the tariff, will undoubtedly be the most effective agent for assuring the conduct of such research.

Geophysical Prospecting and Assessment Work

THE ONTARIO GOVERNMENT has agreed that Hollinger's proposed electrical survey of its Kamiskotia holdings may be accepted as part of the company's annual assessment work, provided that such areas as the survey indicates to be promising be diamond-drilled the following year. This proviso is important. Recently, it will be recalled, the Director of the U. S. Bureau of Mines advanced the idea that geophysical work done on claims might be credited to the annual assessment work. He suggested no way, however, by which fraud might be prevented. The bare proposal, if adopted, would open up a rich field for doodle-bug operators of all kinds.

Ontario has attempted a solution of this difficulty. The stipulation that a geophysical survey must be followed by drilling, sinking, or other exploratory work the following year, if it is to count as assessment work, would be a check, although a limited one. With a company of Hollinger's standing, it would be quite sufficient; indeed, a check might seem unnecessary. But if the rule were made general, cases where it would not work can be easily imagined. Claims might be held for two years without any assessment work whatever, the owner simply swearing, as to the first year, that a *bona fide* geophysical survey had been made, even though made with a willow stick, and in the second year deferring the performance of the drilling or digging until the last day of the year. An effort to insure the genuineness of the geophysical work might be made by licens-

ing "geophysicists" for the purpose of making surveys of this character and requiring that a survey, to be credited as assessment work, must be made by such a licensed person. Still another suggestion is that the government might accept or reject geophysical work, offered as assessment work, as it might see fit. This is open to the objection that it would leave too much to the discretion of the official in charge.

Geophysical work undoubtedly will be offered as assesment work to an increasing extent, if it proves effective in a practical way. Such questions as those that have just been raised can therefore be considered to advantage in advance.

The Julian Scandal

CULMINATING an intensive stock-selling campaign, Julian Petroleum Corporation dealings collapsed as rumors of fraud and trickery became current. On May 6, 1927, because of an over-issue of stock of the Julian Petroleum Corporation, recently merged into the California-Eastern Oil Co., trading in the stocks of the corporation was suspended on the Los Angeles Stock Exchange. Further transactions were also stopped on the San Francisco Exchange. Federal and state authorities immediately started an inquiry. A grand jury investigation is now under way.

On May 16, 1927, the brokerage firm of A. C. Wagy & Co., Inc., suspended and closed its doors. On May 17, 1927, Federal Receiver H. H. Carnahan made public the fact that the total outstanding preferred stock of the Julian Petroleum Corporation was 3,600,015 shares and the common stock, 1,265,000 shares. The corporation has a total outstanding authorized capitalization of 600,000 shares of preferred and 600,000 shares of common stock, so the over-issuance amounts to 3,000,015 shares of preferred and 665,000 shares of common. Preferred stock has a par value of $50 and has been bought and sold at a price range from $3 to $35 per share; prices of the common stock have ranged from $1 to $10.

What the public has lost in this debacle cannot yet be estimated, but undoubtedly it has been exploited for large sums. Those "in the know" benefited greatly in this huge gamble. Steps are now being taken to fix responsibility and to force restitution from those who profited by criminal operations.

It would be of great public interest to expose the hectic history of Julian Petroleum from its inception by C. C. Julian. High-pressure selling and unscrupulous methods are in themselves a warning to the public to examine closely into the stocks that are offered under such auspices. The part played by newspapers as purveyors of advertising that by indirection and unscrupulous writing creates a false impression of value or of future returns is especially reprehensible. No newspaper should be a party to fraud against its readers; publication of misleading advertisments by which the public is caused to lose its money is altogether too frequent. The maintenance of higher standards by newspapers would eliminate many of the high-pressure selling advertisements and would thereby greatly restrict the activities of individuals who endeavor to sell to the unsuspecting public the dubious privilege of holding an empty bag or one in which much effort is necessary to find anything of value.

A Blow to Russian Development

SEVERANCE by Great Britain and Canada of diplomatic and trade relations with Soviet Russia is a step backward in international trade and diplomacy, which, whether justified or not, is unfortunate. Coming so soon after the Economic Conference at Geneva, it shows by contrast that freedom of international trade, which was there so much discussed, is a theory that is difficult to put into practice. In fact, there is perhaps less freedom of trade now than there was a few years ago, and there seems no immediate hope of much progress in this regard. Especially concerned in the industrial aspects of the break between Britain and the Soviet are many British mining interests, for, since the rapprochement of the two countries, a considerable amount of British money has been turned toward the development and rehabilitation of mines that were forced to close down by the Russian revolution. The present juncture will not be encouraging to further financial support from London. Investors in Germany, France, and the United States will also have the fact brought home to them that such concessions as may be obtained from the Communist government are not to be valued too highly; duplicity in the Harriman manganese concession was practically admitted by one of the Soviet delegates at Geneva.

Russia is a vast mineral storehouse, and it is to be hoped that funds may be made available for its development. Soviet leaders admit their inability to provide such funds and look to foreign capital. They are naturally not anxious to give away concessions without a substantial return. On the other hand, foreign capital is not disposed to enter Russia, with its present leadership, unless the possible gains are so large that unusual risks are warranted. The best policy for the Soviet leaders, if they wish to attract foreign capital, would seem to be one of fair dealing toward the present concessionnaires, and the formation of a stable government that will afford to foreign investors promise of a security of investment similar to that accorded such investors by most other nations.

Rand Customs Changing

RAND GOLD-MINING companies have too often sought big monthly tonnages, even if it meant milling waste. It has been hinted at times that the reason for this is that those in control have had their eyes on the stock market rather more than on the balance sheet. Monthly tonnage reports with the accompanying figures of cost per ton make an excellent impression, if the tonnage be large and the unit cost be low. Big tonnages gained through breaking waste in stoping may give low costs per ton, but stoping over narrower widths with resulting higher costs per ton has been shown to give larger profits in many instances. After all, it is profits that count with stockholders.

Sub Nigel profitably led the way last year in reducing stoping widths, thus raising the cost per ton milled but lessening the cost per ounce of gold produced. The latter is the significant figure. Recently the Anglo American Corporation has decided to report, for companies under its control, the cost per ounce of gold produced instead of the cost per ton of ore. This is a further step in the right direction.

Ford's New Model

HENRY FORD has climaxed a long series of rumors, denials, and counter rumors with the definite announcement of "early" production of a new car—one that "has speed, style, flexibility, and control in traffic." The motoring public will soon know the price, the kind of transmission, the number of cylinders, and a score of details about the new model. The answer to the questions that have been agitating the curious will soon be out.

One group that has no more than a casual interest in these things, but that is mightily concerned with Mr. Ford's announcement, nevertheless, includes the producers of metals. They have reason to hope, first, that the delay in production will be brief; and, second, that the cars will take the public fancy so that they will sell. The more cars Mr. Ford sells, the more material he will require to build them. Aside from steel and the various ferro-alloy metals going into it, an automobile contains in considerable quantity the following: copper, particularly as a constituent of brass and in electrical equipment; lead and antimony, chiefly in bearing metal and storage batteries; zinc, as the other constituent of brass, and in strip and cast form; tin, for bearing metal and solder; aluminum for the body; and nickel for trimming.

In no small measure does the slackness in the automobile industry contribute to the present weakness in prices for the major non-ferrous metals, especially lead. The quantity in each car is not so great; but in a million cars it is enough to make a real factor in the market.

The Ford company has suffered more from curtailed production in the last six months than have any of the other leaders of the industry; and as Mr. Ford is not one to carry large stocks of raw materials, he has not been buying metals. Likewise, the purchases of metals by manufacturers who supply him with accessories necessarily have been curtailed.

With the new car designed and the Ford plants in the process of alteration preparatory to starting production of the new model, inventories of metal necessarily will increase. If, as he promises, he can make a car to sell at a low price, and incomparable in quality at that price, Henry Ford ought to sell automobiles to people who otherwise would not get them, on a much larger scale than ever. In other words, he ought to increase the aggregate number of cars manufactured. No one wishes him better luck than do the metal miners.

The Gold Bonus in Australia

GOLD PRODUCERS in Australia seem to be having about as much success in getting aid from their government as did the operators in the United States under the kindly efforts of Mr. McFadden. The latter's gold bonus bill was about the fairest proposition that could be imagined, in view of the conditions existing at the time that it was introduced in Congress. Conditions are now somewhat easier than before and will continue to improve, unless something unforeseen occurs. Inequities still persist, however, for the manufacturing jeweler gets his "raw" gold at a price unchanged from that which he paid fifteen and twenty years ago, an advantage that he has done nothing at all to merit. Despite this, the gold bonus issue is dead as a doornail in the United States. It is still alive in Australia. May the producers there have better luck!

By the Way

IN THIS DAY of standardization some one should devise a standard mine report—favorable, of course. Such appears to be the notion of the mining company from which a well-known firm of consulting engineers received the following letter. It is reproduced verbatim:

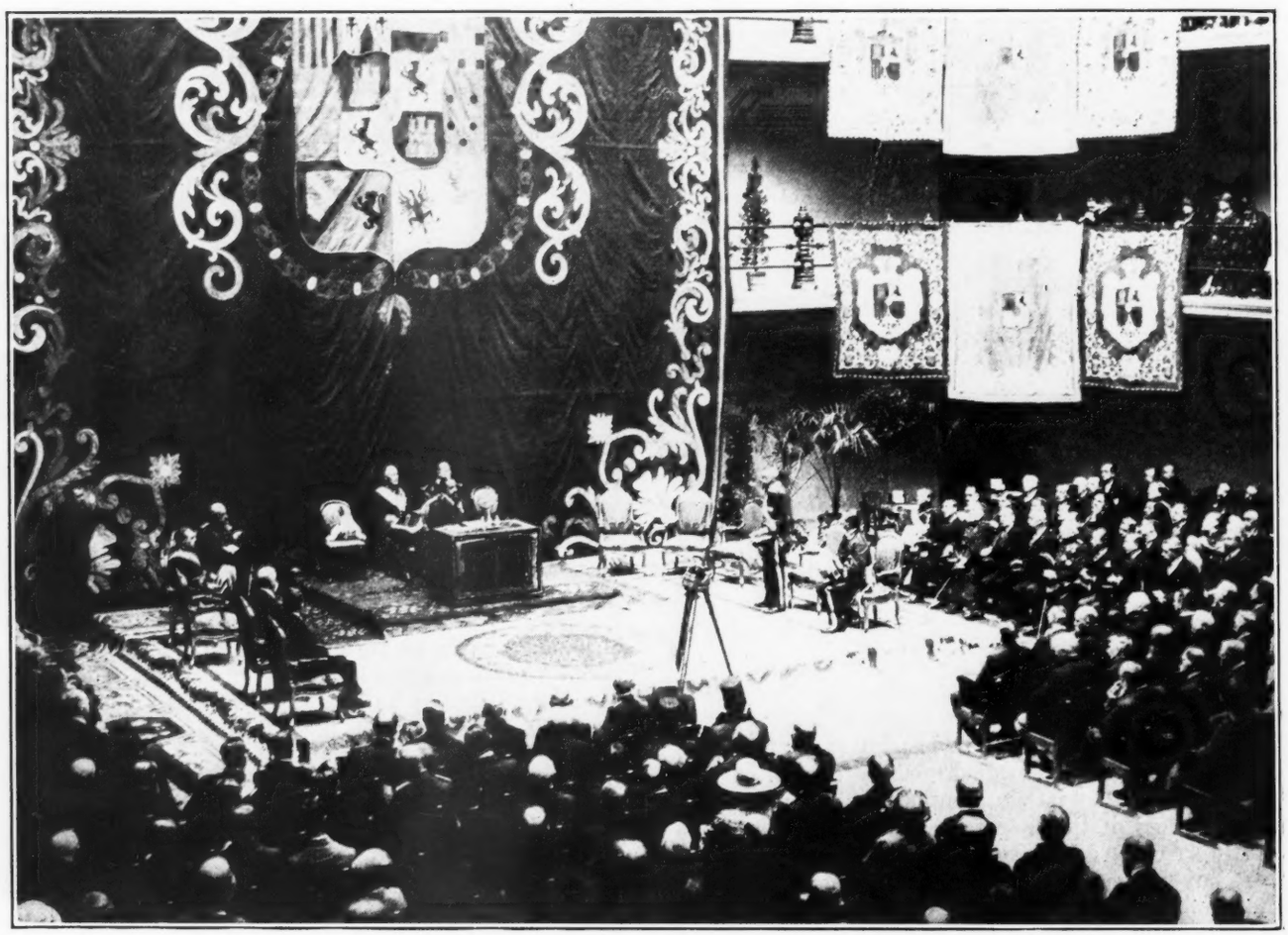
"We would like to get, if possible, a report from you in order to facilitate the selling of our stock. We have already spent considerable money for equipment and machinery and sinking shaft which is now 23 ft. in depth and we inclose a photograph which will give you some idea of what we have done so far. The vein which was 18 in. wide at the surface is now about 7 ft. wide and the vein increases in width as we go down and the ore is also getting harder during the last couple of days. In order to continue the operation, the company has to sell some of its stock and in order to do so you understand that a report of an engineer is essential. Would it be necessary for you to come and examine the property or could you give us a report, which of course we would like to be as favorable as possible, upon the samples we have sent your firm. Please tell us what would be your fees. This report would be published by us. We have read extracts of your report on the X. Y. mine of last July, and it is something in that line we would like to get. An early reply from you will oblige."

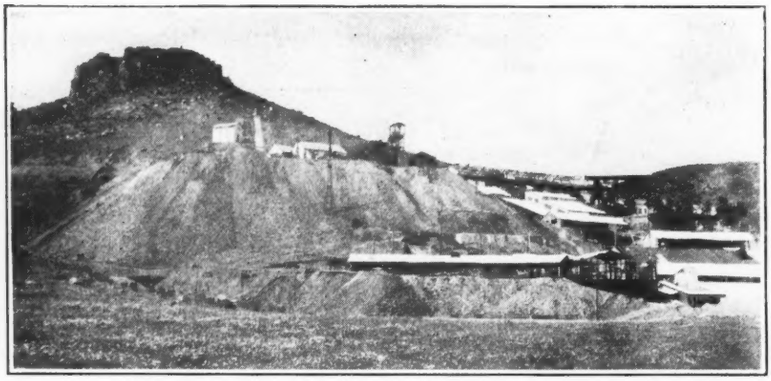
The foregoing letter—for the genuineness of which we vouch—recalls a recent complaint of a newspaper columnist who had devoted a lot of high-priced effort to concocting a burlesque on certain favorite stunts of the tabloid newspapers. The next day one of the tabloids came out in all seriousness with a story that far outdid his burlesque. It would be difficult, indeed, to think up a letter of its type that contained more of the sublimely ridiculous than that printed above.

SELECTIVE FLOTATION continues to be of the greatest technical interest. The articles by C. S. Parsons in the May 7 issue and by H. S. Gieser in the May 21 number are supplemented by the interesting letter from Mr. Johnson, of the Chief Con., in this issue. Mr. Johnson points out that in his experience lime is not a depressant of sphalerite when used in modest quantities but rather increases the floatability of that mineral; in large quantities it admittedly inhibits the flotation of most if not all minerals, so perhaps local conditions have an effect at the Utah plant. Likewise, soda ash is found to promote the flotation of pyrite at the Chief Con. Calcium sulphite is mentioned by Mr. Johnson as a zinc depressant; apparently it has substantially the same effect as sodium sulphite, an effect that may be attributed to the SO_2 radical. More discussion on the oils and reagents used in selective flotation is desired. Let us hear, too, what the Australian and other far-off engineers are doing that is different from the practice so far published. Every one will thereby gain.

AMATEUR ECONOMISTS may or may not find profit in supplying the missing links in the following abridgment of the explanation advanced by one of the large sellers of arsenic for the dullness of the present market for that product of western lead and copper smelters: Current Paris feminine fashions. Knee-length skirts. Growing demand for hosiery—full length—of silk and near silk. Corresponding decline in demand for mere cotton hosiery. Dull market for cotton. Discouraged farmers down South. Curtailment of crop suggested. Thriving boll weevil but little demand for calcium arsenate. Dull market for arsenic. Q. E. D.?

The Geological Congress in the Land of Don Quixote





At the top is shown the opening meeting of the Congress at Madrid; the King is in the chair, and Señor Rubio is speaking. Below is seen the Mirador shaft of El Centenillo mine, with Mrs. Courtenay De Kalb in the foreground. Above, behind the mules, is the ruin of a Moorish tower, at the La Rosa mine. To the left is the main shaft of El Guindo.

With the Geologists in Spain

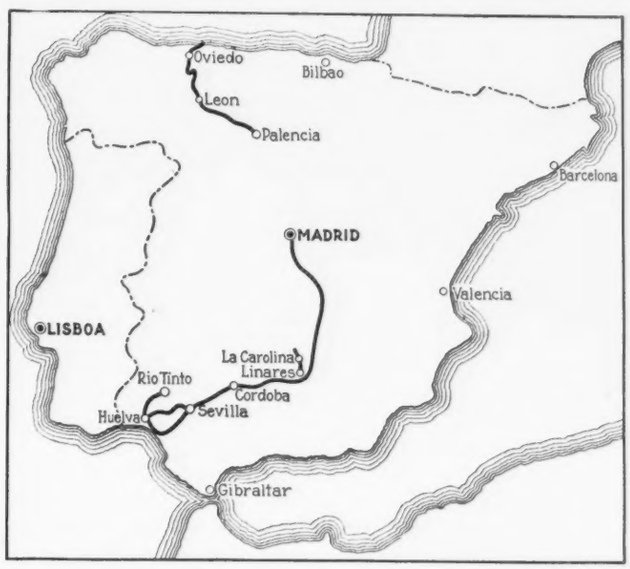
Vesuvius—the International Geological Congress at Madrid—Linares Mining District—Arrayanes, El Guindo, and El Centenillo Mines, Huelva

By T. A. Rickard

ON MAY 10, 1926, the delegates to the Fourteenth International Geological Congress began to assemble at Madrid. Four of us (Professor Kemp and Mrs. Kemp, my wife and I) came from Italy, where, among other interesting things, we had seen Vesuvius in action. As this is a geologic item, I record it here. The train from Naples takes the traveler to Pugliano, whence an electric tramway extends to the foot of Monte Cateroni, upon which the observatory stands. One passes through a series of vineyards that yield the grapes from which the famous Lachryma Christi wine is made. From here a rock railway with a maximum incline of 25 deg. ascends to the Eremo station, where the view, from the garden of the hotel, is memorable. The best pictures, I venture to say, are seen, not from the summits of mountains, but on the way thither, before the composition of the landscape becomes too panoramic. Such was the view from Eremo, on the southern slope of Vesuvius; we looked down upon gardens and vineyards extending to the sea; the wide curve of the bay of Naples, a tranquil blue under the summer sky, was dotted with boats on the wing; the ribbon of yellow shore stretched to Naples itself, gay in the sunlight; then came the promontory of Pausilippo, crowned with villas, and beyond it the inlet of Baia. On the waters, like ships at anchor, were the islands of Ischia and Capri; beyond the latter rose the bold headlands of Sorrento, where the Appenines meet the sea. Fair is the view, but with a touch of melancholy, for in the plain are the funeral mounds of buried cities. In front, not far from the shore, sleeps ancient Herculaneum; southward by the sea is Torre Annunciata; inland is Bosco Reale; and near it a brown patch marks the ruins of Pompeii, which is not yet wholly disinterred from the blanket of volcanic dust and stone that smothered it in 79 A.D.

From the Eremo station another electric tramway goes past the observatory and across dark-brown fields of rough lava to the foot of the mighty cone of Vesuvius. Here we changed into the cars of a funicular railway, 900 yards long, set at an angle ranging from 49 to 55 degrees. The short journey is intimidating; one feels in mid-air, as in a balloon. The best thing to do is to become lost in admiration of the view. In the plain, 3,000 ft. below, the brown streams of old lava can be seen invading the green vineyards. Near the observatory a few stunted trees and scattered tufts of grass grow on the lava, but from the base of the funicular railway upward the desolation is complete. Stone walls have been built to prevent the rain from washing the so-called volcanic ashes (lapilli and scoriæ) over the cultivated ground.

From the upper station, 3,727 ft. above the sea, a footpath leads to the edge of the crater, at an altitude of 3,822 ft. Standing there one can distinguish the outlines of successive flows of lava, more particularly those of 1858, 1872, and 1906. Looking down upon the *campagna* seaward the eye follows the lava stream that in four days, twenty years ago, ran to Torre Annunciata, six kilometers from the mountain. This flow of molten rock was 20 to 50 meters wide and from 3 to 5 meters thick. The crater made by the eruption of 1906 is becoming filled by successive emissions from the central cone, which is only a hundred feet high above the floor of the crater, and only five to six hundred feet from the rim, where one can stand safely while watching the volcano at work. When doing so, we were joined by Professor Malladra, who is stationed at the observatory; whereupon I suggested that the volcano was *gentil;* to which he replied that it was *"un volcan domestique, un laboratoire."*



Outline map of Spain and Portugal, showing route taken by members of the Geological Congress

Behind the central cone, or vent, we could see the old crater of Somma, the rim of which, I may add, contains fragments of fossiliferous limestone that have been torn from the strata underneath the plain. In the new crater at our feet the older lava was yellowed by weathering, so as to suggest sulphur incrustations, but the later lava on the farther side was black. From cracks in these later outpourings and from the steep sides of the crater itself the steam was rising in scattered jets. From the central cone the white steam rose noisily at intervals, a spell of quiet, while little or no steam escaped, being followed by puffs that changed into a blast as the hot vapor rushed forth,

General view of the Linares Mesa

together with red blobs of lava, which fell to leeward. Occasionally the column of steam is tinted pink by reflecting the hot lava within the orifice. A magnificent cauliflower of "smoke"—steam, of course—hangs over the volcano, but it varies in shape continually. As we stood watching the performance we saw a beautiful smoke ring, or vortex, ascending with a drumming sound. Professor Malladra remarked that the vapor of which it was composed moved *"avec une vitesse cyclonique."* The rim of the vent overhangs slightly, owing to congealed lava; as the steam is emitted, therefore, it curls over the edge and forms a ring the material of which whirls with enormous rapidity.

Professor Kemp and I descended into the crater in the company of two guides. The coils of lava over which we walked looked like monsters of the primeval slime in close embrace. Many *colyoptera* of the ladybird type lit on our coats; also a few lapilli, straying from the showers to leeward of the cone; the smell of sulphur seemed appropriate. In the blowholes of the lava stream of yesterday we saw a red glow, and when my foot broke through the crust of the old lava over which we were picking our way, I felt anxious. The guide took some of our silver coins, and then, by the aid of a metal spoon three or four feet long, he dished forth a gob of molten lava, into which, with two sticks, he pressed the coin, and thus prepared an interesting souvenir.

Approaching a minor vent, yellow either with sulphur or perchlorite, I noticed lumps of black lava that evidently had fallen upon the older ropy brown lava; these new lumps were like spun slag, having been violently whirled in their passage through the air. They looked so fresh as to suggest the possibility of the wind veering and our being hit by others like them, but warmer; so we thought it well to return to safety, after a hard clamber across the rough floor of the crater and a hot climb up the steep edge. We realized then how *facilis* was the *descensus Averni* as compared with the laborious ascent over the crumbling scoriæ.

Our return journey was delayed by the Duchess d'Aosta, the train being held for her and her retinue, but our hearts rejoiced when at the Eremo station a lame organ grinder played "Funiculi Funicula," from which, in our then state of mind, it was no labored jump to "funny funicular"!

THE OPENING SESSIONS IN SPAIN

Now we go back to Madrid. The first thing for us to do as delegates was to register at the headquarters of the Congress at the Instituto Geologico de España in the street known as Rios Rosas. There we met the accomplished secretary, Señor Dupuy de Lôme, and later we had the good fortune also to have a talk with the president of the Congress, the distinguished geologist, Señor César Rubio. Several excursions had been organized, including one to Morocco and another to the Canary Islands. We selected the one that took us to the lead and copper mines of southern Spain, so we paid the nominal fee required of us, and then spent a pleasant time in making or renewing acquaintance with our fellow delegates, particularly those from our own country. It was interesting to observe how closely individuals were associated with the geologic terrain or subject in which they had made their researches; thus "we had with us" Lawson of the Keewatin, Ulrich of the Ozark beds, Bruce of the Pre-Cambrian, Wilson of the Grenville series, Hewitt of dolomitization, Scott of Tertiary vertebrates, Kemp of "Ore Deposits," and Bateman of "Economic Geology."

Most of these went with us on Excursion A3 to Linares and Huelva. The party consisted of forty-eight, of whom five were ladies, and two hosts, or conductors, in charge of the excursion. These two gentlemen, to whom we became much indebted for information, courtesies, and kindnesses, were Señores

Alfonso de Alvarado and D. Juan Hereza. Our excursion party was also fortunate in being favored by the company of the president, Señor Rubio. Various countries contributed to our group as follows: Belgium 5, Czechoslovakia 2, England 5 (1 from the Transvaal, 1 from Rhodesia, and 2 from Scotland), Egypt 1, Finland 2, France 5, Germany 7, Japan 1, Italy 2 (both Americans), Sweden 5, and United States 13. This party, of course, represented only a small fraction of the Congress, the total attendance at Madrid being 1,100, of whom 400 were Spanish.

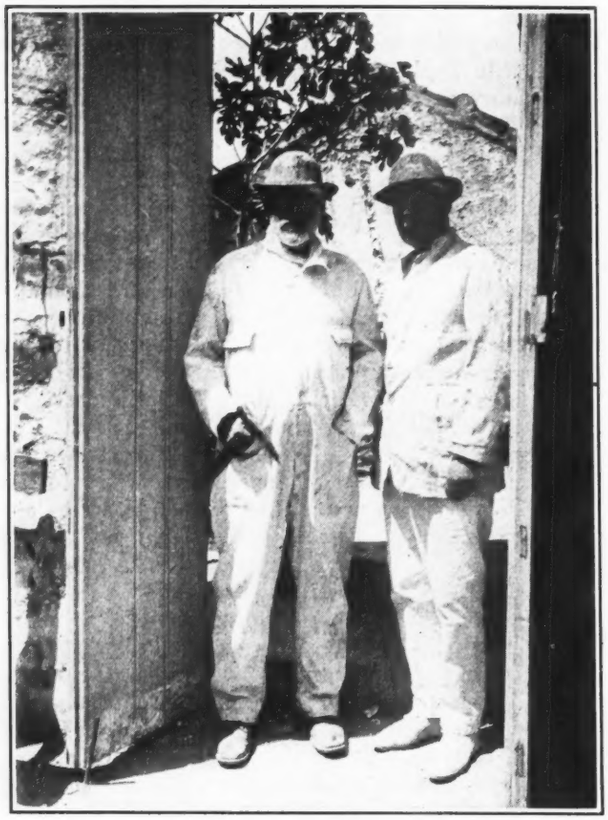
Our special train left Madrid on May 13. The capital of Spain is 2,130 ft. above sea level, and the sunny morning was cool. We enjoyed a Miocene thrill and a Triassic reaction as we proceeded southward over the undulating plain, much of which was devoted to the cultivation of vines, olives, and strawberries. We felt Quixotic, with a Key-hoe-tick pronunciation, as we traversed La Mancha, the arid region in which the knight of Cervantes had disported himself for the amusement of all time. An occasional windmill gave the proper local color. Late in the afternoon we reached Linares, the Hellanes of the ancients, in the province of Jaen, the center of a famous lead-mining district. The train was "parked" at the station, and served as our hotel for three days, much to the interested amusement of the resident population, who, every evening, strolled into the station yard and stared at the visitors as they sat in the much-illuminated dining car. We returned the compliment, for the young women in their *mantillas*, the older ones wrapped in colored woolen shawls, and the men in their straight-brimmed *sombreros* made attractive pictures.

Visiting the Linares Lead Mines

At 7:30 next morning a fleet of automobiles was ready to take us to the mines. We halted to examine the outcrops of the Arrayanes lode; the prospect holes were overgrown with green and the rocky surface of the ground was almost hidden by a crop of barley somewhat spoiled by too many beautiful red poppies. Here a thin (only 35 ft. thick) covering of Triassic sandstone overlies the granite in which the lead ore is found. The granite forms a hill north of Linares, and constitutes the most productive part of the district. The Arrayanes vein is from 2½ to 3¼ ft. wide; the yield of galena is about 120 kilos., or 265 lb., per cubic meter of lode-stuff. A width of two centimeters of clean galena in a meter of vein is said to suffice to meet all expenses. The lead carries 160 to 250 grams of silver per ton. Sorting is done underground, the coarse reject being set aside for filling the stopes, while the fine goes through a 20-mm. trommel, the oversize from this being then sorted by hand while the undersize is jigged, by hand also, through a 2-mm. screen. Fine stuff from the jigs is washed upon inclined tables and round buddles in the old-fashioned way. The middling from the jigs, which contains disseminated galena, is crushed by rolls operated by mule-power through the medium of a *malacate*, or whim. The gangue is chiefly calcite, together with quartz, barite, and siderite, but without blende. It is a clean lead ore.

The Arrayanes is a nearly vertical vein, striking northeast; in it the workings have penetrated a poor zone at 300 to 400 meters, but it is believed that a rich horizon will be found by deeper exploration, which is now being conducted under the auspices of the government. We listened sympathetically while this information was forthcoming, and in the meanwhile the ladies gathered wild flowers, among which were the white plumes of the asphodel, besides forget-me-not, convolvulus, and gladiolus. A white cottage in a field of purple larkspur made a lovely picture under the blue of the summer sky. Old shafthouses, with tall stone chimneys, stood gaunt upon the hill-top, a reminder of days of former activity when they were erected by Cornish mine-captains in the employ of English companies. It was springtime, and, old as the mines

The Geological Congress at Los Guindos



The late James F. Kemp and a friend about to descend into El Centenillo mine

might seem, the earth was young again. The warm red soil of a plowed field, the tender green of barley, in which the red poppies flourished, the brown ground between serried ranks of olive trees, stretching for miles, the dark hills in the middle distance, and the purple ridges of the Sierra Morena, the Montes Mariani of the Romans, made a picture that appealed alike to the æsthetic sense and to the historic imagination.

We rattled through the narrow streets of La Carolina, where a mining colony was established by Charles III in 1767, as one is reminded by the Teutonic names of surviving families. Here a bold outcrop of quartzite, emerging through andalusite-schist, suggests the ore-bearing formation, but the granite also is the country rock of several productive mines, for, as at Linares, the mining district lies around a granite mass. Proceeding northward from the old town to the bare foothills, we halted at the celebrated El Guindo mine, the chief producer of lead in Spain. In 1925 this mine yielded 21,000 tons of galena containing 75 per cent of lead, out of the total 62,000 tons yielded by the Linares district, which contributed 60 per cent of the entire Spanish output. This again represents a quarter of all the lead produced in Europe. In 1925 the St. Joseph Lead Co. in Missouri produced 154,627 tons of pig lead.

The El Guindo vein is from one to two meters wide; it runs nearly east and west, at a steep angle, ranging from 85 deg. in the quartzite to 70 deg. in the schist. The upper workings, in the schist, are not so productive as the lower ones, in the quartzite. During our visit underground we saw a handsome stope, 600 ft. long, in which the vein was 3 to 18 ft. wide, with an average of about 10 ft., in which there was from one to three feet of solid galena, together with mixed galena and quartz. The gangue is chiefly quartz, together with brecciated wall-rock, calcite, and siderite. In genetic sequence the order of the minerals in the vein is quartz, galena, more quartz, calcite with galena, and, latest of all, the siderite. We saw many vugs containing calcite and siderite, and others that were filled with crystalline quartz. The lode is well defined, and the walls are clean, with a selvage of clay, so that it is practicable to strip, or "resue," the ore satisfactorily. The vein fissure has been followed underground continuously for two miles in this mine, and in the entire group of mines it has been explored for a total distance of 6½ miles, on surface and underground.

The tumbled hills of the Sierra Morena are bare where once great forests stood, in mute testimony to the destructive activity of the miner. Such is the fate of every mining region. We climbed the hillside behind the El Guindo mine and obtained a good view. In the foreground was the outcrop of a big cross vein, one out of many; they consist of hard quartz, and they are older than the ore veins, which are softer and more readily subject to erosion. On the opposite slope we saw prospect holes along the vein, but on the hill where we stood it had failed to come through the shale overlying the schist. A few trees, oak and juniper, gave a green fringe to the gullies; and an olive grove in the distance reminded us that, in Spain, oil was a much more important product than lead. The annual output of olive oil is worth 700,000,000 pesetas (at two pesetas per kilogram) as against 125,000 tons of lead worth 118,000,000 pesetas, or about $16,500,000.

On the return journey we deviated a few miles to visit the La Rosa mine, where an ore containing 10 per cent of galena (68 per cent lead) was being hoisted. On a hilltop near by is the ruin of a Moorish tower, one of many that served probably not as fortifications but for signalling across country to the Mediterranean shore. Not far away at Las Navas de Tolosa is the site of the battle in which (on July 16, 1212) the Moors, the Arab-Berber people of Mauretania, on the northern coast of Africa, were defeated by the Christian armies of Alfonso VIII of Castile and his allies. Here also we were served with tea, and with other refreshments even more cheering. Of the delightful *almuerzo*, or luncheon, tendered to us at the El Guindo mine, I have made no mention as yet. Our Spanish hosts were lavish in their hospitality, and the pleasant repasts shared in the happy company of interesting people constituted a memorable feature of the excursion, although it would be unkind to say too much about it to those living under the cold shadow of the Eighteenth Amendment.

THE CENTENILLO MINE OF MUCH INTEREST

An early start next day (May 15) brought us, shortly before noon, to the Centenillo mine. This is 10 miles northeast of La Carolina, and neighbor to the Guindo. The Centenillo is interesting both geologically and historically. In this mine the orebodies are found in Lower Silurian schist and quartzite, chiefly the latter, but the vein is barren in the overlying andalusite-schist of the Upper Silurian. The ore-bearing zone consists of the following series of formations: 150 meters of quartzite; 30 of slate; 140 of quartzite; 80 of slate; and 150 meters of quartzite. The workings are down to 560 meters, at which depth they have

penetrated 60 meters within the third quartzite. Under this comes more slate, the effect of which is portentous. Above the ore-bearing zone, in ascending order, are: 120 meters of slate; 30 of quartzite; and 150 meters of andalusite-schist.

The ore channel is a line of sheeted fractures containing banded inclusions of the encasing quartzite. The stopes extend for 1,400 meters, the average width of clean galena being 10 centimeters. The annual production is 24,000 tons of galena concentrate, averaging 74 per cent lead. Miner's pay is 7½ pesetas, or, at 14c. to the peseta, about $1 per shift. In addition to the fixed wages of 7½ pesetas the miners get a share in contract bonuses sufficient to increase their pay about two pesetas more per shift. Thirteen hundred men are employed by the company, known as Minas del Centenillo. The workers are docile, and labor troubles are rare. A systematic effort is made to maintain good ventilation underground, and special pains have been taken to eradicate *ankylostomiasis*, the hook-worm disease, which is the curse of the old mining districts of Europe, a heritage from the old days of slave labor, when the workers were treated more like beasts than human beings.[1] Several types of Ingersoll-Rand water drills are used, including the Leyner. The lode is from two to thirty meters wide, and averages about seven meters. From 550 to 600 tons of ore containing 14 to 16 per cent of galena, equivalent to 10 to 12 per cent of lead, is treated daily at the mill. The ore is a simple one; what little pyrite it contains passes into the second-class concentrate, which averages 60 per cent lead, whereas the first-class ore carries 80 per cent. The tailing averages 1.15 per cent.

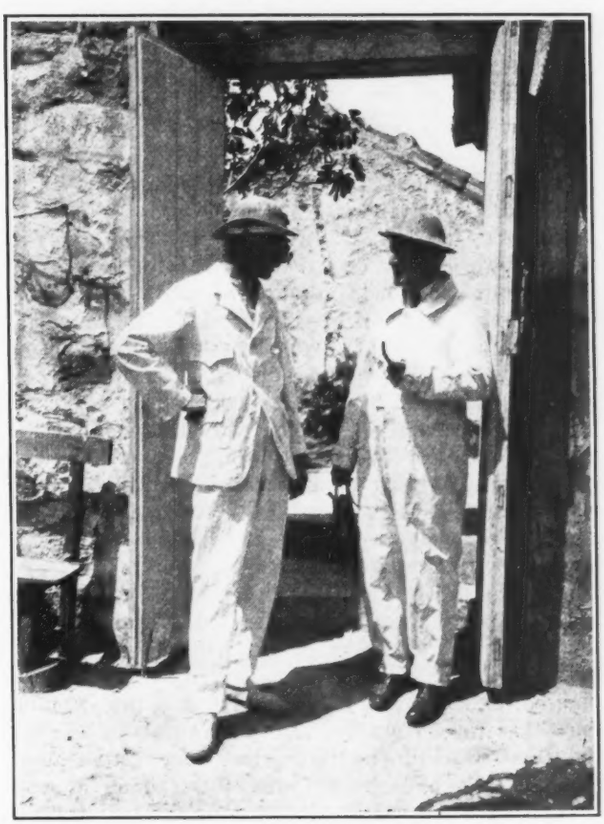
Practice at the Centenillo Mill

During the month of March the stoping done in the Centenillo mine amounted to 6,734 cubic meters, from which had been obtained 2,227 tons of 70 per cent galena. About 25 per cent of the ore broken during the month was left behind as filling. The yield represented one ton of galena concentrate for six tons of ore. At the mill the ore is delivered to bins, and from them to jaw crushers; then it passes over sorting belts. Anything of intermediate size, from one to two inches, goes over a traveling belt, divided in the center, so that the sorters throw the reject from one side of the belt to the other. Another belt takes the stuff that is bigger than two inches. This belt is similarly divided; the sorter picks out the lumps of clay and waste rock, the clay being treated separately. All the ore passes through rolls and over a 12-mm. screen, the oversize being returned by another set of rolls, while the undersize goes to a trommel that has a 1¾-mm. screen. Oversize from this trommel goes to two Hancock jigs, which yield a high-grade galena concentrate, a middling, and a tailing. Undersize from the trommel passes to a sand pump, which delivers to two sets of Callow screens, 30 and 60 mesh respectively. The oversize from the 30-mesh screen passes to two Butchart tables, while the undersize, between 30 and 60 mesh, goes to two James tables, and the minus-60 mesh to another James table. A fourth James table is being added. Middling from the Hancock jigs is classified from 1¾ to 12 mm. by a trommel and thence goes to four sets of rolls, where all of it is reduced to 1¾ mm. Oversize from this last trommel goes to Harz jigs and the undersize is distributed over three Wilfley tables and two Butchart tables, the middlings from these concentrators passing to the sand pump for delivery again on the same machines. There appears to be a lack of fine crushing for the table middlings and insufficient apparatus for the treatment of the slime, but the loss is so small as to render doubtful the advisability of adding any supplementary plant.

The mine has reserves of ore equivalent to 100,000 tons of 74 per cent galena, the silver content of which is 500 grams per ton. This is a pleasant enterprise, small and comfortable: an ore that leaves a nice margin of profit, a simple metallurgy, an efficient and quiet work people, and, as one could see, a kindly and capable management. *Tout va bien. Todo marcha bien!*

Operated by the Ancient Romans Also

The former operations of the Romans were fully as interesting to me as those of the English, even though they were under the direction of my friend J. O. Haselden, and of two Associates of the Royal School of Mines, J. V. Moore, the mine manager, and J. T. Hawes, his assistant. The Roman work at the Centenillo appears to have been divided into three stages; first, they sank a series of shafts into the outcrop of ore, and when these became inconveniently deep for them they drove an adit from the hillside at about the horizon of the present seventh level (150 meters below the surface). This adit entered the lode at a barren point, and it had to go a considerable distance before entering the orebody. The heaps of slag and the remains of buildings outside the entry indicate that the period of this adit was one of maximum exploitation. The Romans dug into the orebody for a length of a thou-



J. O. Hasenden and Louis Wright

[1] "Miner's Hookworm at the Centenillo Mines, Spain," by Dr. Guillermo Sanchez Martin, *Trans.* Inst. M. & M., London, 1926.

sand meters. Subsequently a lower adit was started about 60 meters below the first; this one had to be driven 1,000 meters before reaching the ore. A fourth stage of development had been started when the Romans abandoned the mine, possibly on account of a barbarian invasion. An adit had been begun at the lowest possible level, close to the river at the bottom of the valley; it is not known how far this adit penetrated, because only about 100 meters of it has been cleared, but it is evident that to reach the orebody this gallery would have had to be extended at least 1,500 meters, and that it would have attained a depth of 340 meters below the surface. Numerous coins found in the ruins of the ancient houses prove that this mine was worked during the first century B.C. and thereafter for two, if not three, centuries.[2]

The principal lead manufactures, as shown by the relics discovered in the remains of the smelting houses, consisted of weights having an elongated pyramidal shape, of varying sizes and perforated at the top, probably for use in weaving; also sling bullets weighing two ounces, cigar-shaped, as well as seals that were employed for closing sacks of ore rich in silver. The letters S C on a silver coin represent probably the usual formula *Senatus Consulto*, it being only a coincidence that the letters are also the initials of the company that worked the mine, the Societas Centenilli. These initials have been found stamped on a copper bucket that was used by the Romans for baling water. The same initials appear on a number of Roman seals found in the ruins of the old mining settlement; they were used probably to close sacks of particularly rich ore. The Romans worked only the best part of the vein, which, like others in the district, was richest in silver near the surface; indeed, when they ceased operations in the lower workings, at a depth of 690 ft. below the surface, these were in a lode as rich in lead as it was poor in silver.

The new crater of Vesuvius, with its conical vent, in action

In the deepest of the Roman workings were found several Archimedean screws, used for raising water to the adit. Five of these have been uncovered, but it is probable that as many as twenty were in use at one time. The application of the Archimedean principle to the pumping of water is represented by an extraordinary mechanical device. It consists of a wooden cylindrical core, 8 in. in diameter, into which a helical copper vane, or screw-thread, is fixed, this copper screw in turn fitting into the longitudinal laths of the outer container, or pump barrel, which is 20 in. in diameter. The copper vane, $\frac{1}{8}$ in. thick, is attached firmly to both the core and the casing by copper lugs and rivets. The three-thread screw rested at an angle of 30 deg., and the barrel as a whole is supposed to have been revolved by a slave, who applied his feet to cleats attached to the outside of the barrel about midway. This is the explanation given at the mine, but I venture to doubt it, because the mechanical advantage would be small, and the operation would, it seems to me, soon cause the barrel to leak. An expression of opinion is invited. The pump was 14 ft. long. Each end had an

[2]G. F. Hill and H. W. Sandars "The Journal of Roman Studies," Vol. I., p. 101.

iron point that pivoted into a socket, or hollow, elongated iron cone, set in timber. The screw-barrels were placed in succession, each pump lifting the water 6 ft. vertically and discharging into a box, which emptied into the sump of the next machine, the loss of height between discharge and intake reducing the effective lift to 5 ft., so that twenty of these machines were needed to raise the water a hundred feet.

Egyptian Screw Described by Diodorus

The remains of these pumps were found on the floor of an incline that had been well timbered. It will be remembered that Diodorus, the Greek historian, writing in 25 B.C., says that the Romans gained great wealth by putting slaves to work in the mines of Turdetania, the region now known as Andalusia. "For draining the water," he says, "they use the Egyptian screw, invented by Archimedes of Syracuse when he was traveling in Egypt. These screws raise the water by a continuous movement to the outlet of the gallery, drying the bottom of the mine and making it possible from these to extend the workings comfortably. The art that directed the construction of this machine surpasses all that one can say of it." Archimedes was in Egypt in 220 B.C. and while there he saw the Egyptians using the screw-pump for irrigation, as is done to this day in the Sudan. Diodorus is proud of his fellow Sicilian, as is not surprising, for the construction of the machine presupposes considerable knowledge of the laws of physics and a mastery of mathematical calculations such as will arouse the admiration of the modern miner.

The history of the Centenillo mine did not end with the Romans. In a "Catalogue of Mines" published in Spain at the close of the sixteenth century it is stated that a concession was granted to work a silver mine at El Centenillo in 1538. Traces of medieval workings have been found near the Huerta del Centenillo, an old garden that was watered by the drainage from the second Roman adit. These medieval miners appear to have been unsuccessful, and it is certain that they failed to get anywhere near the bottom of the Roman workings.

History of Modern Development

The first of the existing concessions was obtained by Mr. Haselden's father in 1865. In 1874 the late Arthur Haselden, a brother of the original concessionaire, while engaged in prospecting the property, was captured by brigands when on his way to Linares and was carried by his captors into the hills of the Sierra. A ransom of £50,000 was demanded, a sum so large as to constitute a record in transactions of this character. A much smaller amount of money sufficed, however, after three weeks, to obtain the Englishman's release. This incident delayed the development of the Centenillo, because the payment of the ransom, together with the heavy expenditure incurred in a vain effort to recover the money from the Spanish Government, diminished seriously the working capital available for the purpose. The bandits continued to terrorize the district, because they were secretly protected by the local authorities. Eventually a strong and capable Governor came to the province; he, impervious to local influence and aided by an energetic commander of the Civil Guard, put an end to the brigandage, leaving the mine operators to proceed with their business in safety. The Haselden family participated in the venture, but their advice to sink a shaft to the main orebody, and to the bottom of the ancient workings, was not taken, in consequence of which the company had a precarious existence for many years, until in 1897, the lead market being then lively, sufficient capital was raised to enable the management to explore the Mirador lode. The orebody was cut in 1901 below the old workings, rich ore was found, and since then the enterprise has prospered, as it deserved.

A mile southwest of the Baeza railway station, where our train was standing, are the ruins of Castulo, now plowed land in which ancient stones are found occasionally, most of them having been used to build a neighboring bridge. Castulo was an important mining center in the days when the Carthaginians ruled the land. The town was spared when the elder Scipio defeated Hasdrubal, the brother of Hannibal, at Baecula, in 208 B.C.; and later it became a flourishing city. Livy tells us that Hannibal married a lady of Castulo named Himilce, or Himylie; and it is owing to this tradition probably that sundry ancient workings near Castulo are known as *los pozos de Anibal*, or the pits of Hannibal. The prevalence of this legend has led to many abortive attempts to find the great Carthaginian's mine, and much money has been spent unsuccessfully. When Carthage was destroyed, in 146 B.C., sixty thousand of its inhabitants were sent to labor as slaves in the Spanish mines, of which not long before the Carthaginians had been the opulent masters.

To be continued

Recent Zinc Discoveries Near Sudbury, Ontario

The records of the Mines Branch of the Canadian Department of Mines, according to a bulletin by A. Buisson, show that the knowledge of the existence of deposits of zinc ore in the vicinity of Sudbury dates back about twenty-five years, when Joseph Errington sunk a shaft not far from Chelmsford, Ontario, in the search for copper deposits. Several years later a diamond-drill hole sunk in this region in search of coal seams also indicated the presence of zinc. Recent high prices obtained for lead and zinc probably induced Mr. Errington to follow up these original discoveries. Similarity between the ore proven by both the former workings was noted and further surface prospecting undertaken with encouraging results. Mr. Errington succeeded in interesting a large mining company in the development, and in 1925 an extensive program of diamond drilling was started. The new field is about seventeen miles northwest of Sudbury, and is approximately two miles north of the main line of the Canadian Pacific Railway.

It appears that most of the area underlaid by the sedimentaries of the Whitewater series and extending east and west for about twenty-five miles and with a width of about seven miles has already been staked by various interests. Though development to date has been confined mostly to diamond drilling, the results are decidedly encouraging and the Sudbury area will probably soon have, in addition to its important nickel-copper mines, an important source of zinc and allied metals, as the ores are said to be complex and to include gold, silver, copper, and lead as well as zinc.

Mine-Timber Preservation Worthy of More Attention

By Dr. F. K. H. Moll
Specialist in Wood Preservation, Berlin, Germany

Dr. F. K. H. Moll

THROUGHOUT the history of mining operations it has been found that the timber employed in such work deteriorates very rapidly, much more quickly in fact than in any other class of construction. Nevertheless, from time to time cases have been quoted in scientific literature in which mine timber has been found to have an extremely long life under certain special circumstances. Curiously enough, however, despite the fact that since the beginning of the nineteenth century a large and an important industry has been developed in timber preservation, few attempts have been made on the part of mine owners to profit by the experience gained in this industry. Even at the present time, when technical knowledge is freely disseminated, it is found that mining engineers and mine owners are seldom even in the slightest degree familiar with the matter of wood preservation. Many mining engineers must have realized the importance of any means for decreasing the amount of timber consumed in mining, but unfortunately there is no concise modern book in the English language that deals systematically with up-to-date methods of timber preservation. Even the technical journals printed in English have not paid much attention to this subject, and most published information relates to timber preservation processes which, although quite satisfactory for certain purposes, are not applicable to mining work.

During the last fifteen years mining concerns on the Continent have carried out long and painstaking investigations on this subject, and to a lesser extent the problems have been investigated in the United States, where some of the better-known mining companies have made investigations in co-operation with the Forest Service during the last eight years.

It should be recognized that the experience accumulated by railway and telegraph companies is not of much service to the mining engineer. Conditions of temperature and humidity that obtain in a mine are essentially different from those above ground, and consequently the possibilities of economy by utilizing timber to its utmost possible life are not so extensive as in railway and telegraph work. In mining, each particular case has to be considered carefully and the economical aspect studied in detail. Though of necessity large quantities of timber cannot be recovered, the question of impregnating timber with preservative materials is certainly worth serious consideration.

Timber employed in mining is for the most part of rather poor quality as compared with that used in construction. Ordinary props will cost about half as much as construction timber. The life of ordinary props as distinct from oak, which it was possible to employ in days gone by, is rather short, and there is therefore a good reason for subjecting these to artificial preservation processes. In consequence of the low cost of this timber a cheap and an economical process is necessary.

Every mine has places where timber is expected to last five years or more. This timber is estimated by the United States Forest Service to be about 20 per cent of the total; in Germany it is officially estimated at about 40 per cent; in the coal mines of Great Britain it would probably be about 30 per cent. No reasonably correct figures are available as to the consumption of mining timber, but an estimate may be made based upon the production of coal and the amount of timber normally consumed in coal mines. Production of coal in Great Britain is in the neighborhood of 250,000,000 tons annually, and the timber required on an average is 0.4 cu.ft. per ton. The total amount consumed annually, therefore, must be approximately 100,000,000 cu.ft., and of this about 30,000,000 cu.ft., at least, will be used for permanent and semi-permanent work.

Taking the price of $5 per 30 cu.ft., the above-named quantity of timber represents the sum of $5,000,000. If we take for granted that the life of the timber can be trebled by preservative treatment, and that this treatment will increase the cost of the timber by about 40 per cent, the cost will appear to be about 1c. per ton with untreated timber and approximately 0.7c. per ton with treated timber. As a matter of fact a vast amount of data has been collected relating to the results of modern timber treatment as applied to mining work. As a rule, it has been found that the effect of treatment is to reduce the annual cost for timber to between 30 and 45 per cent of that of untreated timber.

To examine the question as to which process is best suited to mining work, it is desirable to review the results obtained in those countries where such operations are carried out—namely, Germany and the United States. The United States Forest Service and the Association of Mining Managers of the Dortmund district have both published the results of tests. The American tests were not extensive, as the number of props in the different series examined was rather small. At Dortmund, however, twenty different processes were examined and one hundred or more props used for each series of experiments. The results are therefore more readily comparable, and, with the experience gathered in timber preservation for every purpose, and also with the experiences of mining concerns which have been using treated timber for a considerable time, we can obtain a fair view of the present state of this business.

Wood-preserving processes can be divided into two broad classes, the first consisting in impregnating with creosote or other tar byproducts, and the second in im-

pregnation with a solution of salts. Both types of processes give good results, and for certain purposes the treatment with creosote fully satisfies all requirements. For example, the sleepers on colliery railroads, especially in wet situations, are preferably creosoted. For all other mining purposes, however, the use of salt solutions is recommended. There are several reasons justifying this recommendation. For example, creosote, when used in small proportions according to some type of "empty-cell" process, tends to exude when the timber is subjected to the rather higher temperatures in the mine; the surface of the timber becomes dirty; the gangways in which freshly impregnated timber is erected become filled with vapor which irritates the eyes, skin, and lungs of the workers.

Handling of timber underground is not at all a pleasant operation, the space available often being limited. The difficulties are considerably increased as the weight of the timber increases, and more especially in consequence of the slippery surface and irritating smell consequent on the use of creosote. One of the leading mine managers in Germany once stated that "creosoted mine props were simply instruments of torture for the miners." This is true for "full-cell" creosoted timber, though "empty-cell" creosoted timber is likewise not agreeable. These words were used about fifteen years ago, when creosoted treatment of mine timber was extensively practiced. They should be taken to heart by all who are concerned with the treatment of timber and have consideration for the welfare of their workers.

With regard to impregnation by salt solutions, since the time of Burnett and Kyan something like a hundred different compositions have been proposed for use in the preservation of timber, but only a very few have survived. Zinc chloride, which has been used with some measure of success in the treatment of railway ties in Austria and the United States, is not efficient in the hot and moist situations in mines and tends to dissolve out. Sulphate of copper (Boucherie's and Margary's processes are found to be less efficient), brine potash salts, and others are only effective in proportions of more than 5 lb. per cubic foot of timber, this making the process uncommercial. The important Kyanising process, which is employed with such successful results for telegraph poles, necessitates that the timber should be peeled, but this is not practicable in the case of mine props. Thorough impregnation of mine props can be accomplished only in a closed cylinder in vacuum.

Basil Malenkowicz, a Croation engineer, has been investigating the application of fluorides during the last twenty years and has found that these were most effective in preserving timber. As the result of extensive trials and investigations upon a large scale Malenkowicz realized that sodium or zinc fluorides alone, although splendid preservatives, would not be satisfactory when the treated timber might be subjected to varying conditions of weather, wind, and temperature and the attack of different fungi. In the course of his investigations he discovered that salts of dinitrophenol in a mixture with fluoride proved to be highly efficient. Today such mixtures under the names of Glückauf-Basilit are used extensively by Continental mines. The studies of Malenkowicz were continued by Netzsch and Novotny and adapted by Wolman especially to mining purposes. The technique of impregnation with solutions of this kind is somewhat similar to that employed with chloride of zinc.

New Process for Recovery of Valuable Mica Wastes

Recovery of highly valuable mica wastes, hitherto lost in the ground-mica industry owing to incomplete settling of fine materials in the wet grinding process, is promised as the result of experiments conducted by the U. S. Bureau of Mines, at its Non-Metallic Minerals Experiment Station, New Brunswick, N. J. The solution of this problem is indicated in the application of electrolytes as flocculating reagents. As finely ground mica is a high-priced product, attaining a value of $100 to $120 per ton, losses from this source attain proportions that demand a remedy.

In the mining of mica, a considerable tonnage of material is produced which is so damaged by rumpling, folding, the presence of impurities, and lack of size that it cannot be manufactured into sheet goods. This material was considered worthless in the early days of the mica industry, and no effort was made to recover it. The discovery that ground mica produced from this scrap is of value to many industries has resulted in the profitable disposal of most of such material now being produced as a byproduct at the mines. The supply of scrap mica from this source is augmented by the trimmings produced in the manufacture of sheets; by mica not suitable for sheet goods produced as a byproduct in the operation of feldspar mines and clay pits; and by production from mines which are operated for scrap alone. Utilization of scrap mica has been a benefit to many mines, as it has afforded a source of additional revenue sufficient to justify the operation of properties which could not produce sheet mica alone in quantity having a value great enough to pay for the cost of production. The market absorbs from 5,000 to 9,000 tons of ground mica per year.

Inspiration's Milling Results

The annual report of the Inspiration Consolidated Copper Co. for the year 1926 gives complete details of the operation of the company's flotation plant in Arizona. The following data are from the report:

Inspiration's Mill Statistics for 1926

Ore milled, tons	5,219,662
Average per day of milling operations, tons	14,499
Average number of sections running	14.8
Average rate per section, tons	978.0
Screen analysis of mill feed to concentrating machines (on 48 mesh) per cent	3.6
Assay of mill feed, per cent	1.020
Oxide copper in mill feed, per cent	0.207
Assay of general mill tailings, per cent	0.260
Oxide copper in general mill tailings, per cent	0.201
Smelter assay of concentrates produced, per cent	33.985
Assay of flotation concentrates, per cent	35.92
Assay of table concentrates, per cent	5.57
Moisture in general concentrates, per cent	9.00
Ore required to produce one ton of concentrate, tons	45.7
Recovery of copper in milling (smelter assays):	
Calculated from assays only, per cent	75.08
From assays and weights of concentrates and ore, per cent	76.18
From assays and weights of concentrates and tailings, per cent	75.35
From assays and weights of ore and tailings, per cent	75.08
Recovery of copper sulphides in ore, per cent	92.91
Fresh water used per ton of ore, gal	241.0
Power used per ton of ore milled:	
Coarse crushing, kw.-hr	0.46
Fine grinding and concentrating, kw.-hr	9.56
Blowers for flotation air, kw.-hr	1.88
Filtering and reclaiming water, kw.-hr	0.89
Lighting, kw.-hr	0.12
Total, kw.-hr	12.91
Steel-ball consumption in fine grinding per ton ore milled, lb	1.5231
Flotation material per ton ore milled:	
Lime, lb	1.39
Potassium and sodium xanthate, lb	0.05
Pine oil, lb	0.13
Total, lb	1.57

Pouring 45,725 Yards of Concrete at the Inspiration Copper-Leaching Plant

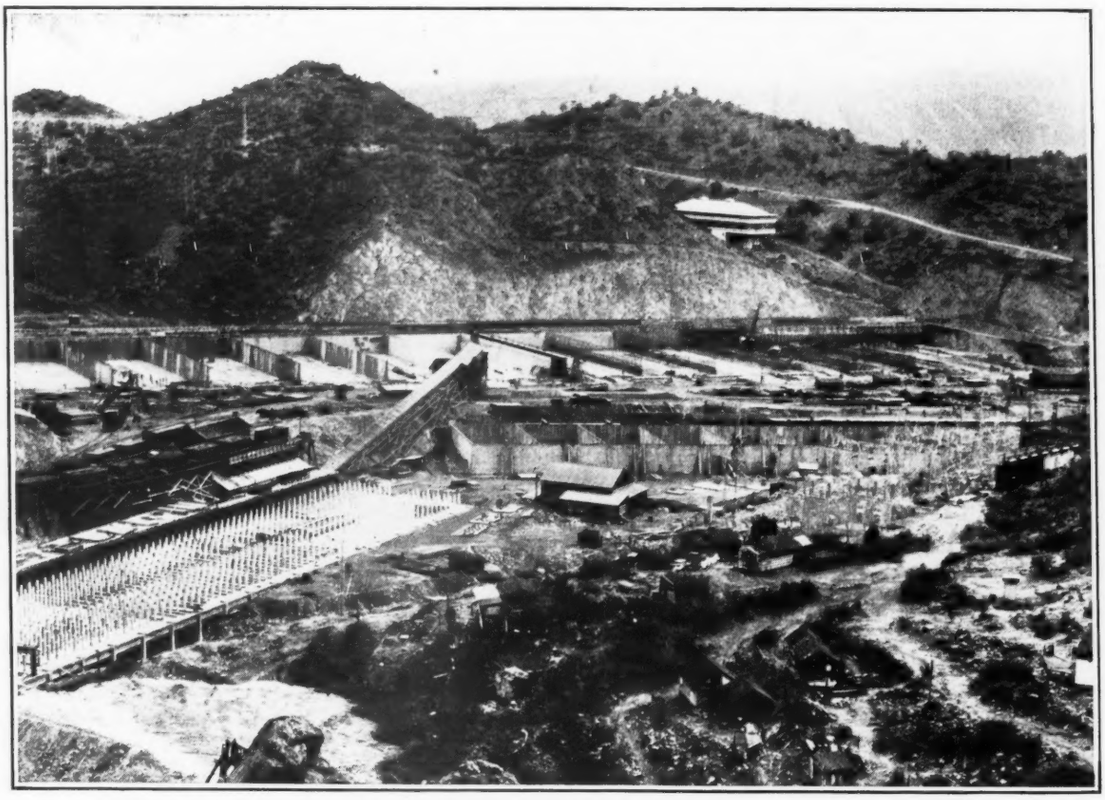
By George H. Booth
Mechanical Engineer, Inspiration, Ariz.

George H. Booth

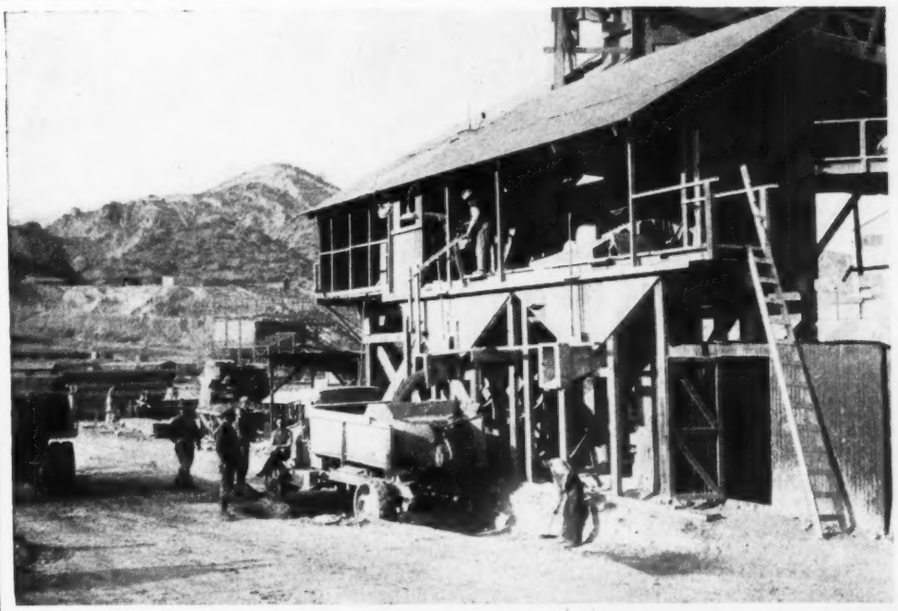
THE Inspiration Consolidated Copper Co., at Inspiration, Ariz., recently completed an 8,000-ton leaching plant which is now operating to capacity. In this work 46,000 cu.yd. of concrete was poured. As the plant is 1,300 ft. long by 1,000 ft. wide, it was apparent that it would be necessary to transport the concrete over considerable distances if a central mixing plant was to be used. There was not enough concrete in any one place or structure to warrant the use of a hoisting tower with the usual spouting system. It was decided to use a central mixing plant and to transport concrete in half-yard cars running on tracks where the forms were not far from the mixer. Where the distance was too great to use cars and tracks, concrete was taken from the mixer to the forms in five-ton automobile trucks. Both methods have their advantages, but for long hauls or for small yardage, the trucks were cheaper and more flexible than cars running on tracks. On the other hand, under certain conditions the cars proved better than the trucks, for it was possible to lay tracks over forms where a five-ton truck could not run.

The main structures, in the order poured, were roll plant, solution tanks, leaching tanks, tank house, and "iron" launders. The base of the roll-plant bin contains 2,266 cu.yd. of concrete and the rest of that plant 1,115 cu.yd., covering an area 220 by 100 ft. The base of the bin, 220 ft. long, 32 ft. wide, and 20 ft. high, was poured before the central mixing plant was completed. A half-yard mixer was set up opposite the center of the bin, and rock and sand were brought to it in wheelbarrows from storage piles on the ground on both sides of a standard-gage spur track. Cement was taken from the box cars in which it was shipped.

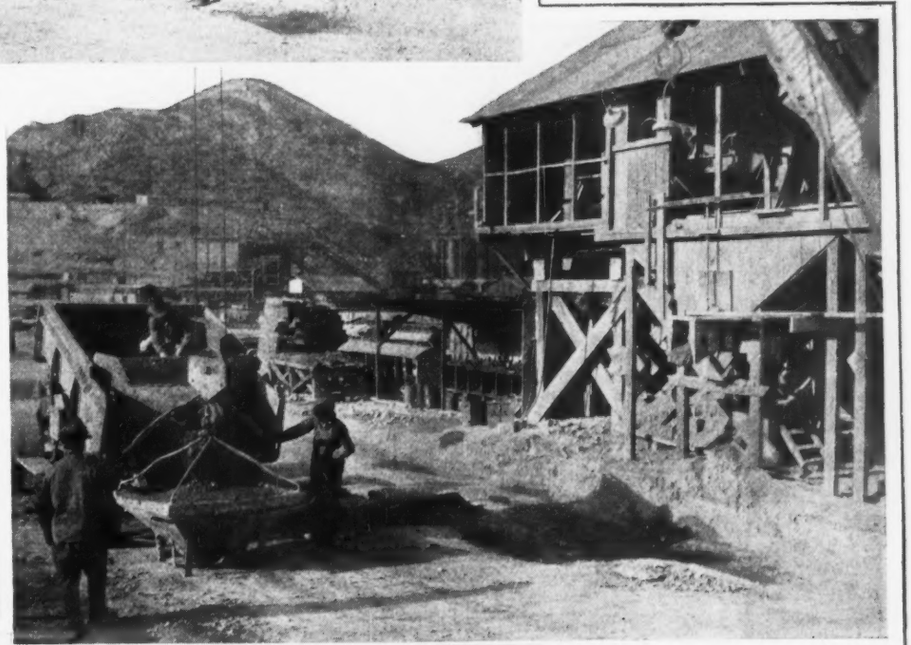
As the design of the bin made it difficult to stop pouring without leaving a weak joint, pouring was continued without intermission for five days and nights on that part above the columns. The mixer discharged concrete into half-yard cars running on a track along the front of the bin, and a crawler crane picked the hopper body of the car off the trucks, and, raising it,



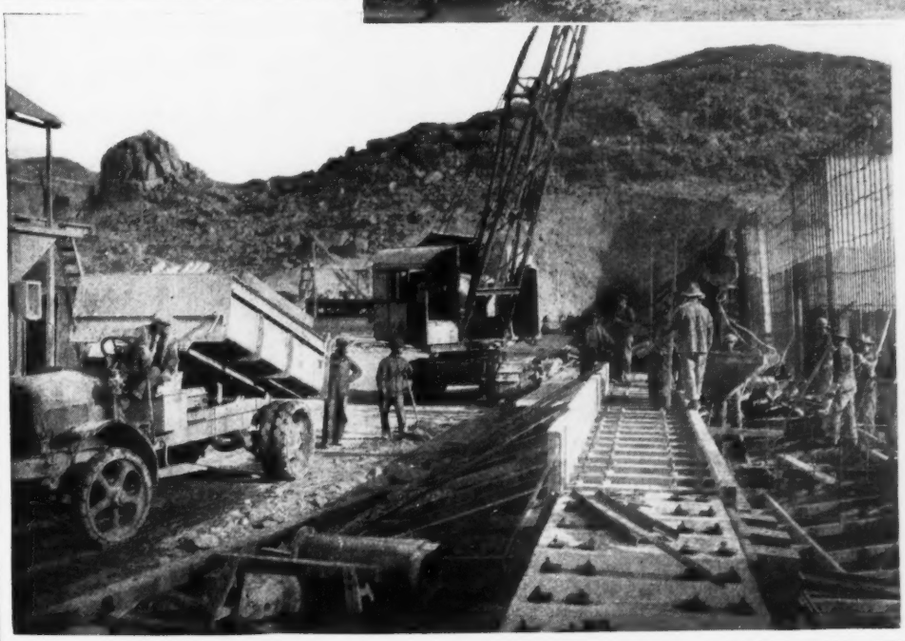
View of partially completed plant showing central location of mixers. The tank-house foundation is in left foreground, solution tanks are in center and leaching tanks in background



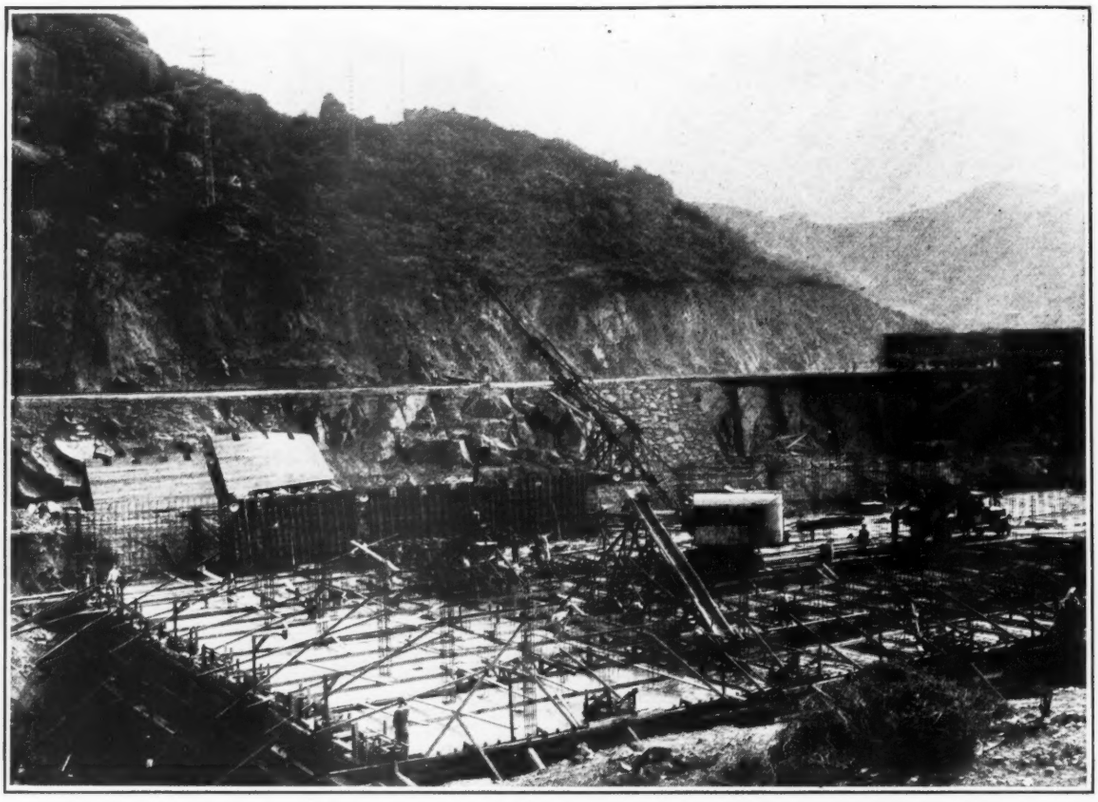
Truck being filled with concrete from mixer



Truck delivering concrete to hopper hung on crane



Discharging concrete into forms from hopper



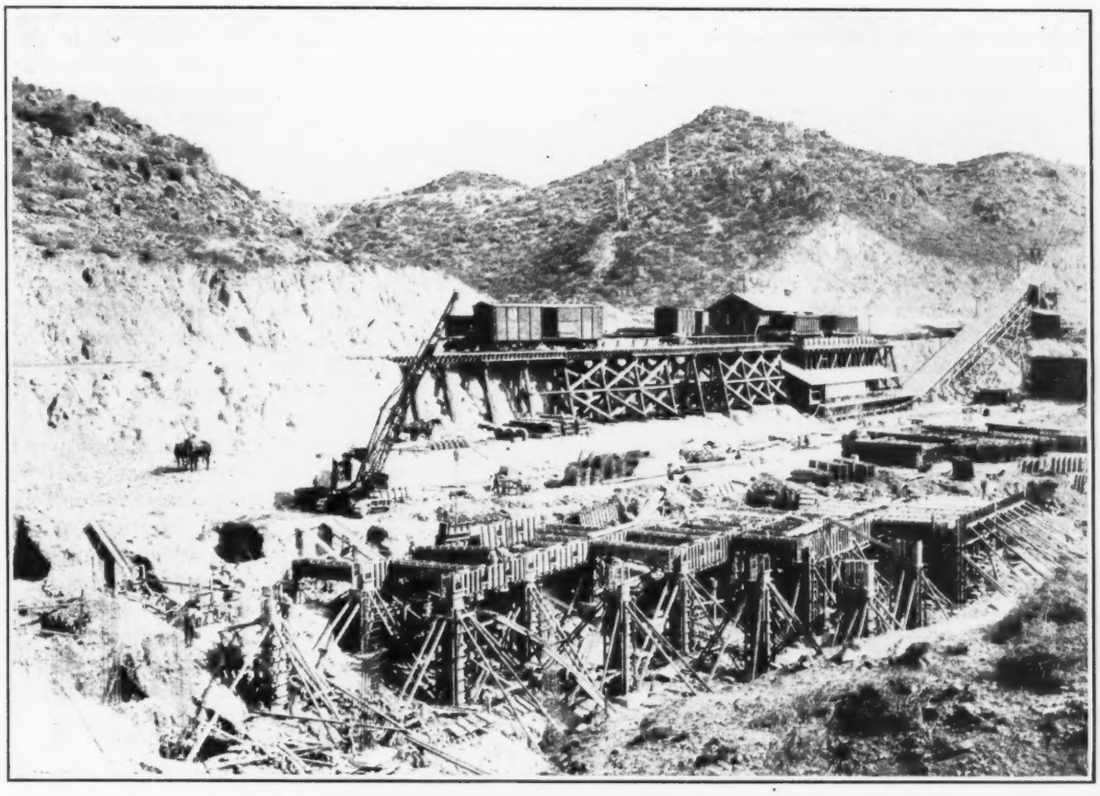
Crane holding concrete hopper over chute to pour floor of tank house. Concrete has been delivered by a truck which filled the hopper and is waiting to refill it

held the car hopper over a distributing box above the bin forms until the concrete was discharged into the box. The distributing box ran on a track over the center of the forms for their length, and was provided with spouts from both sides to the forms.

The crawler crane was driven by gasoline and had a 40-ft. boom. It was used throughout the job for raising concrete above the ground level or for swinging a concrete hopper to deposit concrete where a truck could not go. It was found that the combination of transporting concrete in trucks, discharging into a hopper which in turn is swung over the form by a crawler crane, is a flexible method of handling concrete and proved to be the only feasible one for much of the work in question. An ordinary five-ton truck with a dump body was used. The sides were made higher, and a

Concrete Used in Construction

Item	Location	Concrete Material					Costs					
							Forms			Reinforcing		
		Cement, Sacks	Sand, Cu.Yd.	Rock, Cu.Yd.	Gravel, Cu.Yd.	Plums, Cu.Yd.	Labor	Material	Total	Labor	Material	Total
1	Webster creek wall	1,407	3	6	303	40	$768.75	$239.74	$1,008.49	$86.41	$492.04	$578
2	Foundation of bins at roll plant	2,894	295	321	.....	106	305.23	38.40	343.63	327.10	2,314.52	2,641
3	Bins at roll plant	11,192	1,013	1,244	.....	.....	11,132.57	6,370.27	17,502.84	2,319.96	7,876.26	10,196
4	Roll plant, foundations	5,585	483	747	.....	44	1,939.20	954.40	2,893.60	448.94	2,138.86	2,587
5	Roll plant, floors	911	74	125	.....	14	885.58	245.91	1,131.49	32.74	275.48	308
6	Screening plant	529	44	73	.....	47	503.46	98.62	602.08	2.00	.....	2
7	Screening plant, floors	636	53	87	.....	.....	190.80	16.32	207.12	37.22	85.14	122
8	Conveyors, foundations	882	73	123	.....	12	1,869.37	455.96	2,325.33	177.75	235.91	413
9	Conveyors, floors	238	20	33	.....	.....	14.59	.....	14.59	18.16	219.40	237
10	Conveyor No. 11, foundations	980	77	131	.....	.....	820.04	208.12	1,028.16	83.33	184.69	268
11	Sampling plant, foundations	1,005	85	144	.....	.....	1,780.25	268.44	2,048.69	212.46	323.75	536
12	Leaching tanks, substructure	34,942	2,917	4,420	420	54	26,538.30	5,858.95	32,397.25	10,214.13	20,096.77	30,310
13	Leaching tanks	113,384	9,455	14,183	1,505	.....	32,491.24	9,299.38	41,790.62	16,858.07	79,018.25	95,876
14	Pipe launders	7,870	655	1,053	35	.....	.....	.....	.....	.....	.....	.....
15	Solution tanks, substructure	7,880	714	922	100	.....	5,288.56	1,429.65	6,718.21	1,905.81	5,265.67	7,171
16	Solution tanks	35,520	2,940	4,118	780	.....	13,103.04	3,599.58	16,702.62	8,081.63	27,376.57	35,458
17	Pump houses Nos. 2 and 3	1,027	82	140	.....	.....	.....	.....	.....	.....	.....	.....
18	Pipeway at solution tanks	2,748	229	382	.....	.....	.....	.....	.....	.....	.....	.....
19	Solution tank No. 11	5,515	383	522	140	2	2,519.64	261.92	2,781.56	659.25	2,351.35	3,010
20	Pump house No. 1	2,322	161	268	.....	.....	.....	.....	.....	.....	.....	.....
21	Electrolytic plant	17,390	1,463	2,316	.....	60	18,308.33	6,670.32	24,978.65	8,895.63	13,185.93	22,081
22	M-G. room, foundations and floors	3,120	252	426	.....	14	2,685.48	630.30	3,315.78	454.22	1,209.11	1,663
23	Iron launder, floors	1,842	156	257	.....	.....	2,177.05	83.74	2,260.79	560.19	1,101.93	1,662
24	Iron launder	4,903	409	611	70	.....	4,604.53	589.86	5,194.39	889.39	3,526.46	4,415
25	Yard drain	2,933	245	412	35	.....	.....	.....	.....	.....	.....	.....
26	Railway retaining wall	1,842	157	203	.....	.....	.....	.....	.....	.....	.....	.....
27	Acid-storage tanks	856	69	118	.....	.....	1,164.59	264.68	1,429.27	160.11	208.58	368
28	Lubricating-oil house	388	30	52	.....	.....	341.83	60.43	402.26	44.31	177.31	221
29	Boiler house, foundations	737	50	84	.....	.....	328.63	16.50	345.13	20.16	.....	20
30	Boiler house, floors	180	14	23	.....	.....	48.94	.....	48.94	1.65	.....	1
31	Solution-heating plant, f'ndation	312	17	24	.....	.....	643.20	31.09	674.29	.....	.....	.....
32	Solution-heating plant, floors	528	39	79	.....	.....	5.23	8.08	13.31	97.50	312.35	409
	Totals	272,498	22,657	33,647	3,388	393	$130,458.43	$37,700.66	$168,159.09	$52,588.12	$167,976.33	$220,564



The central mixing plant. A rock and a sand car are standing over the bins; the cement house is between them and a cement car. An inclined belt conveyor carries dry aggregate to the mixer

false bottom was built to slope toward the discharge end. The regular end-gate was removed and the usual type of concrete cut-off gate installed, with the rear end covered for about 3 ft. to prevent concrete slopping over when the body was being raised to dump. As thus remodeled, the body held 2½ cu.yd. of concrete. There was a decided tendency for the rock to settle toward the gate, but by poking a shovel from above, through the open gate, it was possible to draw off concrete that was well proportioned.

The hopper into which the trucks discharged held ½ cu.yd. and had a bottom gate that could discharge concrete into forms, through a light metal funnel.

The central mixing plant consisted of bins for rock and sand, and a cement shed. Rock and sand were drawn off into measuring hoppers which discharged

# of Inspiration Leaching Plant

Item	Location	Costs									Cu.Yd.	Cost per Cu.Yd.
		Cement	Sand	Rock	Mixing	Placing	Finishing	Sub Total	Overhead	Grand Total		
1	Webster Creek wall	$1,125.22	$144.65	$65.90	$281.02	$201.49	$41.29	$3,446.51	$824.44	$4,270.95	255	$16.75
2	Foundation of bins at roll plant	2,529.39	259.24	675.47	395.56	699.75	24.75	7,569.41	1,762.04	9,331.45	454	17.12
3	Bins at roll plant	10,090.98	1,726.60	2,029.10	825.84	2,098.01	188.10	44,657.69	5,564.17	50,221.86	1,721	29.18
4	Roll plant, foundations	4,820.10	704.37	871.63	639.87	566.43	114.64	13,198.44	3,087.61	16,286.05	955	17.05
5	Roll plant, floors	757.91	132.57	305.95	176.70	167.40	209.02	3,189.26	517.30	3,706.56	160	23.17
6	Screening plant	449.91	76.64	164.05	118.03	45.03	66.67	1,524.41	465.57	1,989.98	144	13.82
7	Screening plant, floors	558.66	98.80	152.69	100.24	65.96	86.01	1,391.84	345.94	1,737.78	107	16.24
8	Conveyors, foundations	768.06	132.57	200.62	157.63	105.85	66.69	4,170.41	523.76	4,694.17	162	28.97
9	Conveyors, floors	215.02	39.95	65.69	40.27	34.98	33.53	681.59	139.02	820.61	43	19.08
10	Conveyor No. 11, foundations	837.61	151.65	226.38	145.14	91.15	117.94	2,866.05	510.83	3,376.88	158	21.37
11	Sampling plant, foundations	904.77	156.18	255.66	184.79	306.31	132.73	4,525.34	562.56	5,087.90	174	29.24
12	Leaching tanks, substructure	29,273.68	5,472.70	8,368.47	6,138.02	7,203.72	124.55	119,289.29	20,177.78	139,467.07	6,241	22.35
13	Leaching tanks	96,614.78	17,155.01	27,851.92	16,232.75	10,257.83	6,077.03	311,856.26	61,283.41	373,139.67	18,955	19.68
14	Pipe launders				815.16			24,775.54	4,280.62	29,056.16	1,324	21.95
15	Solution tanks, substructure	6,582.06	1,296.62	1,819.99	1,462.75	1,644.69	3.30	2,669.10	4,300.02	30,999.12	1,330	23.31
16	Solution tanks	29,783.03	6,511.18	7,536.31	5,525.19	5,264.45	2,413.68	109,194.66	19,159.35	128,354.01	5,926	21.66
17	Pump houses Nos. 2 and 3				115.50			2,891.21	546.39	3,437.60	169	20.34
18	Pipeway at solution tanks				316.00			8,739.61	1,493.69	10,233.30	462	22.15
19	Solution tank No. 11	4,687.00	715.50	1,154.38	695.87	396.22	187.31	13,628.44	2,547.68	16,176.12	788	20.53
20	Pump house No. 1				218.90			6,825.18	1,034.59	7,859.77	320	24.56
21	Electrolytic plant	14,813.87	2,638.21	4,053.32	2,771.92	4,031.62	1,791.39	77,160.54	9,198.17	86,358.71	2,845	30.35
22	M-G. room, foundations and floors	2,734.51	474.08	746.36	519.39	536.67	425.05	10,415.17	1,690.91	1,210.08	523	23.15
23	Iron launder, floors	1,685.22	258.78	455.40	409.42	210.71	180.91	7,123.35	1,011.96	8,135.31	313	25.99
24	Iron launder	2,689.30	741.30	1,200.16	742.52	425.54	199.19	15,698.25	2,651.14	18,259.39	820	22.27
25	Yard drain				273.60			8,861.40	1,616.55	10,477.95	500	20.96
26	Railway retaining wall							4,457.16	1,028.13	5,485.29	318	17.25
27	Acid-storage tanks	746.78	118.04	201.51	157.74	142.90	74.58	3,239.51	455.87	3,695.38	141	26.21
28	Lubricating-oil house	356.95	59.93	95.87	66.60	50.61	54.19	1,308.03	200.45	1,508.48	62	24.33
29	Boiler house, foundations	672.64	10.90	181.98	184.58	141.35	102.50	1,659.24	404.14	2,063.38	125	16.51
30	Boiler house, floors	164.34		44.39	28.55	51.58	11.15	350.60	90.53	441.13	28	15.75
31	Solution-heating plant, foundation	288.89	36.32	63.92	60.49	54.55	68.50	1,246.96	100.23	1,347.19	31	43.46
32	Solution-heating plant, floors	483.01	79.90	129.61	80.69	92.21	36.11	1,324.69	255.42	1,580.11	79	20.00
	Totals	$214,633.69	$39,191.69	$58,916.73	$39,880.73	$34,887.01	$12,832.81	$843,875.14	$147,830.27	$991,705.41	45,724	.....

onto a 36-in. belt conveyor that carried the dry aggregate to the mixers. The cement shed was located on the level of the top of the bins, and two steel chutes ran from the storage floor to the platform beside the sand measuring hoppers. These chutes were kept filled with sacks of cement; and the man who drew sand into the measuring hopper also dumped cement on top of the sand. As a sack was removed for emptying, the sacks in the chute would slide down one sack length.

All dry aggregate went to batch hoppers above the two mixers, one of one-yard size and another of half-yard size. One set of measuring hoppers at the bins was used for the larger mixer, and another for the smaller one, the batches being released on signal bells rung by the mixer operator.

The solution tanks lay below the mixers. Concrete was spouted directly from the mixers to half-yard hopper cars which were pushed by hand around an oval track inside the walls of the ten tanks. These solution tanks cover an area 100 ft. by 473 ft., and are 20 ft. high. Their total concrete yardage is 7,256, and about a third was poured directly from the cars, and the remainder by raising the car hopper above the forms with the crane, or by swinging the hopper over floors that could not be reached from the track.

Thirteen leaching tanks comprise the leaching equipment. They have a concrete yardage of 25,196 and cover an area of 196 by 932 ft., with walls about 18 ft. high. Half of the substructures under the leaching tanks were poured from cars and the remainder by trucks emptying directly into forms; the tanks proper wholly by trucks and crane.

Pouring by Truck and Crane

Tank-house foundations are partly over a creek bed, which made both form work and pouring expensive, the building being 104 by 512 ft., and the main floor partly on ground and partly on posts which are from a few feet to 30 ft. high. The concrete yardage there is 3,368; and a small part of the floor was poured directly from the trucks, but most of the concrete was placed by the crane.

The "iron" launders are 70 by 245 ft. and 6 ft. high, containing 1,133 cu.yd. of very heavily reinforced concrete, which was also placed by the crane.

Wall forms for both the solution tanks and the leaching tanks were made of wood in large panels, covered with light galvanized steel, and were moved along the walls on rollers. When necessary to swing forms over a wall, the crawler crane was used. The solution tanks were erected by first pouring the longitudinal end walls of the ten tanks, and subsequently the divisional walls. The thirteen leaching tanks were poured in a different manner, the back longitudinal wall against the hillside being poured first and then the end and divisional walls, leaving the front longitudinal walls until last. This made it possible to place nearly all the lead lining and wooden sheathing with one end of the tank open, thereby reducing the cost of delivering material which otherwise would have had to be raised over the walls.

During June, 1925, the first concrete was poured; the last in November, 1926, a period of eighteen months. An average of 85 cu.yd. per day was poured, although there were many days when no concrete was mixed, and consequently there were days when the pour amounted to as much as 300 cu.yd.

Some explanation is necessary regarding the accompanying table of costs. The variation in the cost per cubic yard is due to the design of the various structures rather than to the location or method of pouring. That is, the bin base and electrolytic plant foundations required expensive forms that could not be used over again and also involved more than usual handling to place the concrete. Costs per yard are high for conveyor foundations, sampling plant, and acid-storage tanks, because the amounts poured in one place were small and the equipment necessary to pour was expensive. All three contain a large proportion of floor for their total yardage. The floor of the solution-heating plant shows a high cost for the same reasons as the above and also because there were long time intervals between several different pours.

There has been no attempt to adjust figures or correct what may appear to be errors, the table being taken from the daily reports of the construction forces which were checked by two independent groups. The column marked overhead is the pro-rated charge of various items, amounting to $3.23 per cubic yard of concrete. This overhead includes such items as field engineering, supervision, construction equipment, and power.

Rock was obtained from a quarry on the company's property, being broken in a jaw crusher followed by a disk crusher with about 1½-in. opening, and then screened. The sand was obtained from a wash and screened, the gravel removed being used instead of crushed rock in massive foundations or thick floors. Plums were used when possible, and consisted of hard boulders found near the plant site. The mix was 1:2:4 for most of the work, but was varied somewhat to suit designs. Cement was furnished by the Southwestern Portland Cement Co., of El Paso.

More than 2,000 tons of reinforcing steel, bent to desired shapes, was furnished by the Columbia Steel Corporation, of Los Angeles. The one-yard mixer was made by the Austin Machinery Corporation, was belt-driven and power-tilted.

Twelve side-dump Insley hopper cars were used. They held 22 cu.ft. when level full and ran on a track of 24-in. gage, one wheel on each axle being loose.

A sack cleaner and a sack baler, both furnished by the Handy Sack Baler Co., were used to great advantage. One per cent of the cement used was recovered from the cleaner.

The forms were held together and kept properly spaced by ⅝-in. Universal rod couplings with cone nuts. This proved to be a satisfactory method of accomplishing this work.

The crawler crane, gasoline driven, was supplied by the Pawling & Harnischfeger Co. It operated smoothly with little trouble and only short delays due to repairs.

Increased Zinc Production

The output of recoverable zinc from mines in the United States in 1925 increased 11 per cent over that of 1924, according to statistics issued by the Bureau of Mines. Nearly three-fifths of the country's total mine production was from the Oklahoma-Kansas-Missouri region. Reports show an increased production in all zinc-producing states but three—Kentucky, Montana, and New Mexico. Notable gains were made in several of the Western states. In California the increase was 275 per cent, in Utah 183 per cent, and in Idaho 104 per cent.

Discussion

The Action of Certain Reagents in Selective Flotation

THE EDITOR:

Sir—The article entitled "Selective Flotation," by C. S. Parsons, published in your issue of May 7, is undoubtedly a very commendable addition to present-day literature on this subject.

In the section relating to modifying reagents and their effect on various mineral and ore constituents the impression is gained that these modifying reagents may be expected always to behave in relatively the same manner toward similar minerals or constituents of different ores. Results secured in the laboratory and in actual mill operations on lead-zinc-iron sulphide ores from the mines of the Chief Consolidated Mining Co., at Eureka, Utah, are somewhat at variance with this impression, in one or two instances. Their actual behavior and the extent of this divergence may, therefore, be of some interest.

Mr. Parsons speaks of lime as an active depressant of sphalerite. On Chief ores this does not apply; lime actually increases the floatability of sphalerite if added in amounts up to 8 or 9 lb. per ton of ore. In practice the addition of lime, as the hydrate, ranges from 2 to 4 lb. per ton of ore; additions in excess of 4 lb. per ton tend to coagulate the gangue to such an extent that a high "insoluble" content appears in the zinc concentrate. The beneficial effect of small amounts of lime in the flotation of zinc sulphide is discussed in Bulletin 16, Research Investigations for the year 1924-1925, published by the University of Utah in August, 1925.

Of soda ash Mr. Parsons says: "Its action as a *depressant* on sulphides of iron is not great. . . ." Again we find a contradiction of evidence; on Chief ores it has been found to rival acid in *reviving* pyrite for flotation, even after very thorough deadening of the iron mineral by previous applications of the sodium-cyanide zinc-sulphate couple and lime. Consequently, when used in the zinc and iron separation here, the result was not to sharpen the separation but rather to make it indistinct. The University of Utah bulletin previously mentioned also records data corroborating our results on the behavior of pyrite in sodium carbonate circuit. Later in Mr. Parsons' article he speaks of soda ash as follows: "Its effect is sufficient to keep the pyrrhotite from floating, but pyrite floats readily."

Although Mr. Parsons states that no success has rewarded the use of zinc sulphate and sodium cyanide in inhibiting the flotation of pyrite from lead-zinc-iron sulphide ores, unless they are brought together before entering the ore pulp, experience at the Chief concentrator has shown no discernible difference resulting from the mode of application of these two reagents. Yet the failure to add both, even though not previously brought together, does result in an increased zinc-iron content in the lead concentrate.

A chemical modifying reagent of which no mention is made in Mr. Parsons' paper is calcium sulphite. Some success has met the use of this reagent in actual operations as a zinc depressant. On some ores it has been possible to adjust the amount and method of adding this salt of calcium so that an appreciable amount of pyrite has been floated ahead of the zinc, resulting in a bulk lead-iron concentrate much to be desired where the pyrite is argentiferous.

This comment is not to be considered as an adverse criticism of Mr. Parsons' article. Perhaps the results secured here are merely exceptions that will aid in proving the general rule. In any event, observations of actual operations at other plants are of interest in discussions of this nature. HOMAR L. JOHNSON.

Eureka, Utah.

Mr. Parsons Replies

THE EDITOR:

Sir—I wish to thank Mr. Johnson for his discussion on my article on "Selective Flotation," that you published. The comments he has made are well worth while.

I regret that the wording of the article tended to give the impression that modifying reagents in general might always be expected to behave in relatively the same manner toward similar minerals, because my idea was to give the general rule and to discuss the exceptions separately. Mr. Johnson's comments on the use of lime are very interesting, as out of probably forty different zinc ores I have never run across any in which the flotation of the sphalerite is promoted by the addition of lime. It would be interesting to have a description of the sphalerite which responds in this manner.

The amount of iron the sphalerite contains seems to have an influence on its flotative property. My observations lead me to believe that the higher the iron in the blende the sharper the selective action which can be obtained between the lead and zinc. That is, the light-colored blendes float much more readily and are not affected by inhibiting reagents to so great an extent as the dark-colored blendes.

The discussion of the functions of soda ash is difficult. It would probably have been better if I had gone into the use of it more thoroughly. To begin with, it is quite true that soda ash (carbonate) will revive pyrite. We have just completed a successful 20-ton flotation test on a tailing from a cyanide mill. In the mill the ore had been ground to 75 per cent —200 mesh in cyanide solution and agitated in pachucas for forty-eight hours, lime being used to maintain the alkalinity, then vacuum filtered, repulped and filtered again. The final filter cake was the product we floated. A high-grade sulphide concentrate was obtained by the use of soda ash to revive the pyrite, which contained the remaining gold. The flotation conditions obtained during the test were excellent. It will be observed that in this instance lime is coupled with cyanide, and it has been my general experience that when lime and cyanide are coupled the subsequent addition of soda ash will promote the flotation of pyrite which has been deadened by the combined action

of these two reagents. On the other hand, I have found that soda ash alone has a slight deadening action on pyrite and quite a decided deadening effect on pyrrhotite.

In the flotation of copper-nickel ores high ratios of concentration have been obtained dropping both pyrite and pyrrhotite by using soda ash as the only addition reagent. Also, a similar separation has been made, copper sulphate being used as well, on ores containing sphalerite, pyrite, and pyrrhotite. But then, again, I have frequently had the contradictory experience of obtaining better results by using soda ash when endeavoring to float pyrite—for example, a gold ore in which the values are contained in the sulphides. From these apparently contradictory results I have drawn the general conclusion that the effect of soda ash is to increase the difference between the relative flotative property of the minerals.

Referring to the use of zinc sulphate, Mr. Johnson has, I think, misinterpreted the meaning I intended to convey. In reading over the original manuscript of the article I find that the last sentence of the paragraph he refers to should have been inserted before the sentence which reads "The action of zinc sulphate is more effective when used with sodium cyanide, the two being mixed by bringing the streams of the two reagents together just as they enter the flotation pulp." I did not intend to convey the impression that they were not so effective unless the zinc cyanide emulsion was formed before entering a pulp. For instance, we are at present conducting a 50-ton test on a copper-zinc-iron sulphide ore in which the cyanide is being added to the ball mill with soda ash and the zinc sulphate put into a contact tank from which the pulp goes direct to the copper cells after a contact of twenty minutes.

What I did intend to say in the article was that so far as my experience went, zinc sulphate, sodium acid phosphate, or sodium hydrosulphite had no effect when used separately in preventing iron sulphides from floating.

The problems which are met with in ore treatment are so complicated by marketing conditions, such as requirements of smelter, freight, and treatment charges, that it is difficult to write concisely on the subject when treated in the broader sense.

An example might be cited of an ore on which the test work has just been completed. The ore was a lead-zinc containing both gold and silver—lead, 3.1 per cent; zinc, 4.6 per cent; gold, 0.35 oz. per ton; silver, 2.5 oz. per ton; iron, 12 per cent, present as pyrite. In this ore the zinc shows a marked persistence to float with the lead in spite of the use of both cyanide and zinc sulphate, and the inhibiting effect on the pyrite was not sufficient to allow a marketable zinc concentrate to be produced. That is to say, when the flotation of zinc was attempted the iron floated in excess. The fact that the effect of the cyanide was not sufficient to prevent the pyrite from floating with the zinc did not allow a marketable zinc concentrate to be made. To add to this complication was the fact that part of the gold was associated with the pyrite and to obtain the maximum returns from the smelter it was necessary to obtain as much gold as possible with the lead concentrate.

It was necessary therefore to endeavor to float at least a part of the pyrite with the lead and at the same time prevent the zinc from reporting there too. Lime could not be used, as it deadened the pyrite completely, and 65 per cent of the gold reported in the final tailing. It was found that by grinding the ore with 6 lb. of soda ash per ton, which was sufficient to keep the pulp alkaline, and by adding an emulsion of 0.25 lb. of cyanide per ton and 2 lb. of zinc sulphate per ton, to a time contact tank for a contact of twenty minutes before the flotation, sufficient iron floated so that a lead concentrate could be obtained containing 82 per cent of the gold, 81 per cent of the silver, and which ran 32 per cent lead with a recovery of 90 per cent, and assayed 13 per cent zinc. By subjecting the lead tailing to a time contact with 5 lb. of lime per ton and 1.5 lb. of copper sulphate per ton and using xanthate, a 52 per cent zinc concentrate was produced with a recovery of 68 to 70 per cent. It should be explained that tests were also run using cyanide alone, and no difference was noticed so far as the inhibiting effect on the pyrite was concerned, but the effect on the sphalerite was greatly increased by the addition of the zinc sulphate. The reason for adding these two reagents as an emulsion was that apparently better results were obtained, in that it inhibited more of the zinc and less of the pyrite from floating than if the two were added separately.

I hope that the above will help clear up the points under discussion. C. S. PARSONS.

Ottawa, Ont.

The Prospector Speaks Again

THE EDITOR:

Sir—I note that you have had several articles on prospectors. What is a prospector? He is a gentleman that takes a chance, packs his pony or jack with a grubstake, pick, pan, shovel, trusty rifle, hammer, and magnifying glass, gives a glad handshake to his friends, and says good-by. He is off to some mountain range or gulch. If he finds a likely spot, he pitches camp, and carefully prospects the ground. If he makes a discovery, he will trace out the section lines to find if he is prospecting on N. P. R. R. land. If it is a railroad section, he moves on and leaves the find to be rediscovered by a N. P. R. R. geologist, which is very unlikely. If he happens to be on a homestead entry, he would be locating a lawsuit.

If he locates, he must then secure capital. If he can show $20 worth of ore for every dollar he needs it is quite likely he can get a mining engineer to examine the prospect and report on his find. It was the prospector that made California famous for her mineral wealth, also Colorado, Arizona, Montana, Dakota Nevada, and Idaho; not the mining engineer. The prospector is in a class all his own. H. B. DAEMS.

Varney, Mont.

Belgian Congo Has Iron as Well as Copper

THE EDITOR:

Sir—Mr. Olin R. Kuhn, in the May 14 issue of *Engineering and Mining Journal*, says that little is known of the iron-ore resources of Africa. I believe that I have seen enough iron-ore in the northeastern part of the Belgian Congo to justify the statement that there is more iron ore in that region than in any known iron-ore region in the world. The quality of it I do not know, but judging by its appearance it is a very good grade.

Prescott, Ariz. WILLIAM CROCKER.

News of the Week

Summary

THE U. S. TARIFF COMMISSION prepares information for submission to Congress in the event that tariff revision is considered at the forthcoming session of Congress and the commission asked to supply information. Manganese ore, tungsten, quicksilver, and antimony are among the commodities expected to be used as examples in efforts to secure the revision of the law or to discredit it.

Statements by the Russian representatives at the Geneva conference regarding mineral concessions are criticized in London. An international control of tin is rumored. Scepticism is expressed regarding the new tin extraction process said to have been developed in Cornwall.

An expedition is sent by the U. S. Geological Survey to Alaska to explore several thousand square miles of territory between the head of Cook Inlet and the Kuskokwim basin.

Professor P. Kovaloff, a Russian scientist, who has recently been studying the occurrence of platinum in South Africa, states that a refinery should be established in South Africa, and that he regards the future of the platinum industry there as very precarious.

A brief is filed with the Supreme Court by the Attorney General contending that the tariff act does not delegate to the President the power to tax.

Options on the properties of the Mercury Mines Co. are taken by F. W. Bradley, president of the Bunker Hill & Sullivan Mining & Concentrating Co.

Mineral exports of Mexico for the first four months of this year show a large increase over those for the same period of last year.

Extensive prospecting is current in the Slate Lake district of Manitoba.

The Mining Industry in Western Quebec

Excellent Progress Made During the Last Year—Development of Rouyn District Particularly Notable—Gold Prospecting Continues

By E. G. Wilson
Special Ottawa Correspondent

DURING the past year the mining industry in the western part of the province of Quebec has made gratifying progress. The general consensus of opinion is that this section of the province has now excellent prospects for the establishment of a substantial mining and smelting industry.

Development of the Rouyn district has been phenomenal in the short space of the last three years. The town of Rouyn, with 450 buildings and nearly 3,000 inhabitants, has sprung into existence; a sister town, Noranda, has been planned, surveyed, and the erection of buildings started. Water-works and sewerage systems are being constructed. The towns are lighted by electricity through a power line 60 miles long, serving the settlements and the mines of the region. The heart of the district has been put in communication with the large centers in Quebec and Ontario by the building of a railway line 45 miles long and by public telephone and telegraph services.

A brief résumé of what has been completed up to the present time on a number of the most prominent mines follows:

At Noranda, the smelter of Noranda Mines, which will be capable of handling 1,000 tons of ore per day, is nearing completion. Erection of the steel headframe of the new main three-compartment shaft is practically finished, and the shaft sinking is at a depth of 400 ft. and should reach the 600-ft. objective late in June. Stations will be cut at the 400 and 600 levels and lateral work will be started at both of these horizons. The recently installed 25-drill compressor has been tried out and found satisfactory in every respect. The property will be in readiness for capacity production as soon as the smelter plant is completed, which will probably be early in November.

North of Noranda, on the Murray claims, which were formerly under option to the Victoria Syndicate, the United Verde Extension is sinking a two-compartment shaft to a depth of 300 ft. preparatory to proceeding with a program of underground exploration by diamond drill. On the John A. Brownlee property, near by, diamond drilling is being carried on with the object of attempting to locate the extension of the Noranda orebodies. Osisko Lake Mines has a drill working on the lake below the Noranda No. 1 shaft and is contemplating driving a hole to a depth of 2,500 ft. This would be the deepest drilling that has been at-

A view of the smelter of Noranda Mines, Ltd., at Rouyn, Quebec, taken in March, 1927

The Archean shaft, Clericy Township, Quebec

tempted, up to date, in the Rouyn district.

On the south side of Osisko Lake, the Bagamac Mines is sinking a test shaft within the boundaries of the town itself, and encouraging results are reported. Stadacona Rouyn Mines is continuing surface exploration on blocks 8 and 2.

Northwest of Rouyn, 6 miles up the Makamik Road, there is a group of properties, including the Area, Amulet, Grover-Daly, Vickers, Ribago, and Thormoor, on which a great deal of development work has been done throughout the winter. Diamond drills are operating on the Area property with a view to proving up the indications of ore shown by the Lundberg electrical survey which was made toward the end of last year. Amulet, after closing the prospect shaft which had been sunk to a depth of 150 ft., has also been conducting a drilling campaign; some good cores are reported to have been obtained. The Grover-Daly Co., which recently completed several excellent camps, is diamond drilling, as are also Vickers, Ribago, and Thormoor, in an attempt to prove up at depth the very promising showings of disseminated copper ores which they have located on the surface. Two miles north of the Amulet property is the Waite-Montgomery, which is soon to reopen. The property will be ready to ship ore as soon as the smelter is in operation. A spur connects this property with the Rouyn-Taschereau railroad line.

West of Rouyn, along the Cheminis Road which leads to the present terminus of the Temiskaming and Northern Ontario Railway, are many properties which have been developed to some extent. These include the Don Rouyn, the Fiske, the Aconda, and the Halliwell group of the Towgamac Exploration and Alderson-MacKay interests, operated by the last-named company. A 12,000-volt transmission line has been run from Rouyn to the Alderson-MacKay properties. Underground exploration for additional orebodies is in progress. Three miles further on is the Lake Fortune mine, also operated by the Towgamac interests. North of Lake Fortune, in the Montbray district, is located one of the most promising properties in the area—the Nipissing. Extensive surface work, over a period of fifteen months, accompanied by diamond drilling and electrical surveys, has proved the existence of large orebodies on this property. A five-drill compressor was installed in April, and a shaft was begun on the No. 3 area, which is the largest and highest grade of the drilled orebodies.

The situation in the western section of the field has been considerably improved by the news that the Temiskaming and Northern Ontario Railway will extend its branch line into Rouyn. It is probable that the new line will follow the old survey made in 1924, and that a spur will be run northwest to the Nipissing property.

North of the Nipissing property, in Montbray and Hebecourt townships, there is an area which is attracting considerable attention. The region east of Hebecourt, Duparquet, and Destor townships has also been the scene of much preliminary exploration work. Destor Mines and Makamik Mines both have promising showings of disseminated copper ores. Interest is now spreading north of Destor, into Poularies, where encouraging surface showings have found on the Brownlee tract.

Nearer to Rouyn, in a northeasterly direction, is the Archean property, which has been much discussed recently, and which will be energetically developed in the next few months. East of Rouyn, in Joannes Township, many prospectors are busy in a country in which gold-bearing formations predominate, believing that, when the first rush of the copper boom is past, interest will return to gold.

Another section, 35 miles directly east of Rouyn in the Harricanaw basin, is the scene of some activity, with interest confined to gold. This section comprises the townships of Cadillac, Fournier, and Malartic. Located in these townships are the O'Brien property, controlled and operated by the M. J. O'Brien interests; the Thomson-Cadillac; the Kennedy-Sladen; the Lartic; the Robb-Dean; the Siscoe Gold; the Unison Gold; the Clark-Reid; and the Stabell Gold. On the Thomson-Cadillac and the O'Brien properties some interesting gold showings have been opened up. On the other properties fairly extensive development has been carried on.

Extensive Prospecting Expected in Slate Lake District

During this summer the Slate Lake district of Manitoba will probably undergo more prospecting for gold than anywhere else in the province. Noah Timmins has bought a 25 per cent interest in the Gem Lake Gold Mining Co., following a recent examination of the company's property near Slate Lake by one of his engineers. Ten men will be employed all summer under the direction of F. W. McNeil. The extent of the orebody has not yet been determined.

Another Winnipeg syndicate has been formed to finance the prospecting of the fifteen claims of the Redstone group, adjoining the Gem Lake Gold Mining Co.'s property. Supplies have been shipped in and a camp has been built. W. M. McIlwraith will supervise the crew of six men. Surface work only is planned.

The GX Syndicate has twelve claims on the Moose River just north of Flintstone Lake. The syndicate is composed mostly of members of the Winnipeg grain exchange. Last summer they sent out a party of prospectors to acquire claims around Red Lake. En route some interesting showings were found and were immediately staked. From ten to fifteen men worked on the property during the latter part of the season. A wide vein is said to have been traced 400 ft. Supplies for this summer's work have been freighted in, and an extesive program is planned.

Fire in Pilares Mine Reported Under Control

Fire broke out recently in the underground workings of the Pilares mine of the Phelps Dodge Corporation at Nacozari, Mexico, and a request was sent to the Copper Queen branch at Bisbee for a helmet crew to aid in fighting the blaze. Twelve trained men were sent, and with their help the work of bulkheading the necessary raises and drifts is being speedily accomplished. The fire is reported to be well under control.

Area East of Lake Winnipeg Nearing Production

With construction under way on the mill being erected at the Kitchener mine, the gold-bearing area east of Lake Winnipeg, Manitoba, is nearing production. According to T. C. Anderson, vice-president of the Central Manitoba Mines, construction is under way on mill foundations and pouring of concrete will begin immediately.

Four Geological Parties Sent Into New Brunswick

The Canadian Government is sending four geological parties into the province of New Brunswick this summer. Gypsum and salt rock deposits will be studied in particular. The opinion has been expressed by Dr. W. J. Collins, director of the federal department of mines, that the commercial possibilities for gypsum development in the province appear to be promising.

U. S. Geological Survey Party to Explore in Alaska

The Interior Department announces that plans have recently been approved for further geologic and topographic surveys by the U. S. Geological Survey during the coming field season in the Alaska Range in the vicinity of Mount Spurr. This is part of one of the large unexplored regions of Alaska lying between the head of Cook Inlet and the Kuskokwim basin. Although its eastern edge borders on the coast, the rugged glaciated mountains that occupy most of the area are almost untraversable and are separated from the shore by a high marshy lowland that is difficult to cross and that so far has discouraged exploration of the inland region.

This project is part of the general program of mapping our northern territory that has been carried forward by the Geological Survey for the last thirty years as rapidly as funds and personnel have been available and that has resulted in the publication of accurate maps and definite knowledge of the mineral resources of a large part of Alaska. The object of this party is to map as much as possible of the tract of country lying between the region north of Mount Spurr, which was surveyed during the field season of 1926, and the areas covered by earlier surveys in the vicinity of Tuxedni Bay and Lake Clark. The work will be done by a surveying party in charge of S. R. Capps, geologist, with R. H. Sargent, topographic engineer, and four camp hands. The party will probably reach Anchorage early in June and then, together with the necessary pack horses, supplies, and provisions for four months, will embark on a launch and a barge, proceed to the west shore of Cook Inlet, and land on the beach near the West Foreland. From that time as long as forage for the horses lasts or until snow flies, which will probably be about the middle of September, the party will be entirely out of communication with the rest of the world and will travel into the mountains, carrying with them their entire store of supplies and equipment and mapping the land forms and geology as they go.

It is expected that as a result of this expedition information will be obtained concerning several thousand square miles of the public domain about which at present almost nothing is known.

Heavier Shipments from Park Bingham

The raise of the Bonanza Leasing Co., in the Park Bingham Mining Co.'s property, adjoining the famous United States mine, at Bingham, Utah, has been started. This raise will be driven 300 to 400 ft. to reach the B limestone, in which large deposits have been found in the United States mine. Drifting will then be started to reach the intersection of the B limestone and the Rough Wrestler fissure. Operations have been greatly expedited in the Park Bingham property under the direction of C. Enos, manager. Shipments are averaging about twenty-five carloads monthly, and ore showings have increased.

Flin Flon Option Extended

A three months' extension of the option on the Flin Flon property in northwestern Manitoba has been granted by the Mining Corporation of Canada. This prolongs the period which the Whitney interests have to make tests of the ore until Dec. 1. The reason for the extension is that when the spring break-up occurred the milling water became so contamined by the heavy deposits of organic matter in the spring run-off that operations had to be temporarily suspended.

President J. P. Watson of the Mining Corporation recently stated that, since the publication of the annual report, construction of the test mill at the Flin Flon property has been completed by the optionees, and that the laboratory tests at Denver and other places, on which more than $175,000 was spent, proved sufficiently satisfactory to justify the optionees in erecting this mill. Over $500,000 was spent in the construction of the mill and in the preparation of the mine for the extraction of ore for the test runs.

Operations were started early in March, and the engineer in charge reports that up to the time of the spring break-up the results were encouraging, Mr. Watson stated.

Mineral Exports of Mexico Show Large Increase

An increase month by month of mineral exports of Mexico since January 1, 1927, is shown by the official records. The exports of minerals through Tampico have averaged 1,200 tons a day since the first of the year. This is practically double the exports for the corresponding period of 1926. The countries to which the minerals have been shipped are: the United States, Belgium, Germany, France, Holland, and England. Exports through Tampico for the first four months period of this year were as follows:

Zinc concentrates, 58,613 tons; calcinated zinc ores, 15,449; zinc in bars, 2,338; lead in bars, 61,867; argentiferous copper, 3,476; arsenic, 2,279; antimony, 360.

Province of Ontario April Gold Bulletin

Returns received by the Ontario Department of Mines from the gold mines of Ontario for the month of April show the rate of production to be well maintained, the total value being $2,663,298 in April, against $2,629,870 in the previous month.

The producing mines in order of output were as follows:

In the Porcupine district Hollinger, Dome, McIntyre, Vipond, Ankerite, Consolidated West Dome Lake, and Paymaster.

In the Kirkland Lake district Lake Shore, Teck-Hughes, Wright-Hargreaves, Kirkland Lake Gold, Tough-Oakes, Barry Hollinger, and Argonaut.

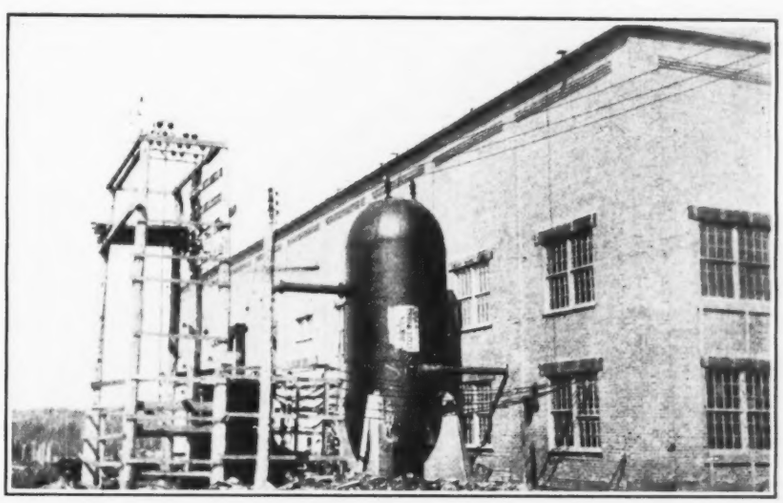
Receipts of crude gold bullion from Ontario at the Royal Mint, Ottawa, for the month totaled 143,090.23 crude ounces, containing 110,839.187 fine ounces of gold and 18,381.03 fine ounces of silver, having a total value of $2,301,550.71.

Mercury Mines Co.'s Properties Optioned to F. W. Bradley

Option contracts were signed recently in Boise, Idaho, for the sale of quicksilver deposits of the United Mercury Mines Co. and the Meadow Creek gold mine of the same company, situated in the Yellow Pine mining district about 150 miles northeast of Boise. The transfer of these properties was made to F. W. Bradley, president of the Bunker Hill & Sullivan Mining & Concentrating Co. Engineers are said to be already on the ground studying transportation problems. Machinery is to be hauled to the mine as soon as the road is open between the mine and the railroad shipping point of Cascade, on the Idaho Northern railroad. The sale price on these properties is reported to involve the payment of $1,500,000, to be made over a period of years.

Rico Argentine Increases Output

Considerable new equipment has been installed in the Rico Argentine mine, at Rico, Colo. By June 1 the management expects to have the property producing 100 tons daily.



The powerhouse, showing air receiver, of the Noranda Mines, Ltd., at Rouyn, Quebec

Many New Operations and Discoveries in Arizona

To Remodel Humboldt Concentrator—Calumet & Arizona Takes Over Claims Near Pantano

With the completion of the lead ore mill at Bisbee, the new lead unit at the smelter in Douglas, and the remodeled concentrator at Humboldt, the Phelps Dodge Corporation will be in a position to handle a large quantity of lead ores produced by its own mines in Bisbee and by independent producers in Arizona and Mexico.

The concentrator and smelter in the southern part of the state will be in operation early this fall, and plans are now under way regarding the remodeling of the recently leased Humboldt concentrator. This plant must be changed over from copper to lead, so as to be used in concentrating lead and lead-zinc ores from the Kingman, Oatman, Prescott, Jerome and Humboldt districts of northern Arizona.

The Humboldt property has not been operated for the last eighteen months. During the war it was one of the large copper producers of the state, operating under the name of the Consolidated Arizona. Following the slump at the close of the war, operations were discontinued, and in 1920 the Southwest Metals purchased the property.

The Calumet & Arizona Mining Co. has recently taken over a group of eleven claims, known as the Gopher group, near Pantano, belonging to the Hiltano Mines Co. According to report, the property was a lead producer of importance last year, and E. P. Hilton, the former owner, is said to have shipped $114,000 worth of lead ore from near the surface.

C. & A. are also making plans for doubling the present capacity of the power plant of the 85 Mine at Valedon, N. M., by the addition of several units of new machinery and equipment. Expansion of the power plant was made necessary by an extension of the workings at the 85 Mine, in which a greater amount of ore is being produced, and a large amount of water encountered. Installation of the new equipment, which will be completed by Sept. 15, will give the power plant a total capacity of 1,500 kilowatts.

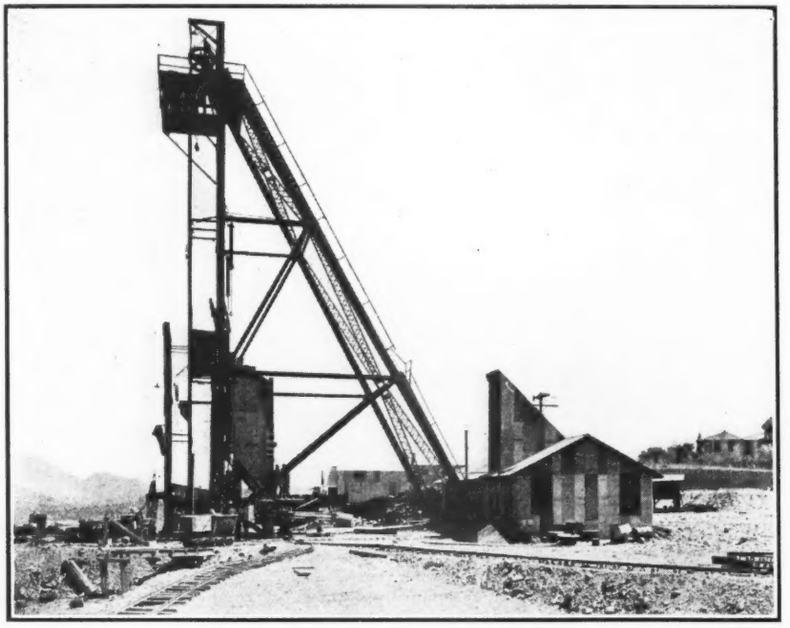
Construction of a proposed road from Aravaipa to Fort Thomas, through Black Rock Canyon, by the Aravaipa Mining Co. was endorsed by the Graham County Chamber of Commerce at a directors' meeting held recently at Safford. The proposed road would facilitate present hauling conditions between the mine and the railroad and reduce transportation costs so as to permit profitable operation of the mine. Lewis Douglas, president of the Aravaipa Mining Co., has requested the financial assistance of Graham County in the construction of the road. With the assistance of co-workers, Mr. Douglas made a survey of the project and submitted a report to the meeting, which indicated that the road would cost between $17,000 and $20,000.

A large block of ore is reported to have been uncovered recently during an examination of the workings of the old Congress mine.

Warren and Bisbee Queen Shafts Make Good Progress

Two new shafts in the Bisbee district are going down at the rate of about 7 ft. per day. The Warren shaft of the Phelps Dodge Corporation has reached a depth of 800 ft. A station was cut at the 700 level, and another will be cut at a depth of 1,000 ft. Longyear Development Co. of Minneapolis has the contract for the sinking.

The three-compartment shaft of the Bisbee Queen Co., a subsidiary of the United Verde Extension Co., at Gold Gulch, has reached a depth of over 600 ft. Tom McNerny has been in charge of this operation.



The new Warren shaft of the Phelps Dodge Corporation in the Bisbee district of Arizona

Current Development Promising in Michigan Copper District

Seneca Mine Installs Sorting Plants—Construction Work at Quincy Nearing Completion

Sorting plants, the first of their kind in the Michigan copper district, will be installed at the Seneca mine, in Nos. 1 and 2 rock houses, this year. The plants will consist of a series of conveyors and elevators for the sorting of the copper rock before it is shipped to the stamp mill. This will be the major item on Seneca's construction program this year. The vein in the bottom of No. 1 shaft, where new drifts are being pushed northward from the 8 and 9 levels recently opened, has widened to 16 ft. Good showings in copper content continue.

The Quincy mine has just cut the new East lode at the 88 level of No. 2 shaft. The crosscut from the shaft to the Pewabic bed has passed through the lode, which is of good width and as heavily mineralized as on the 87 and 86 levels. Drifting on the East vein and the regular Pewabic formation will be carried out in sequence as the new level is opened. No 2 shaft now is bottomed at little below the 89 level. Cutting of the East lode at the 88 level is an important development, inasmuch as there is no diminution in copper content at this depth. The vein was first cut at the 86 level and the persistence of mineralization leads to the belief that it will become a valuable source of metal when sufficiently opened. Quincy is on a productive basis of approximately 1,100,000 lb. of refined copper per month. Total production in 1926 was 13,290,052 lb. Two of the four new boilers being installed at No. 6 shaft are in use and work on the other two is nearing completion. A concrete stack, 190 ft. in height, to serve the new plant, is being erected.

In the Calumet conglomerate department of Calumet & Hecla Consolidated, a raise from the 63 level of the slope shaft will be holed through to the lower workings of the Tamarack Junior about the middle of June. The raise has advanced 800 ft.; about 50 ft. of raising remains to be done. When completed it will serve to ventilate the openings north of the slope shaft, which is a branch of the Red Jacket shaft, and permit the exploration of the ground under Tamarack Junior. The greater part of the raise has passed through a fair grade of stoping rock. This is the northernmost opening on the Calumet conglomerate, and, although less ground is available for stoping than at the Hecla end of the property, the new area will materially increase the ore reserves.

At Mayflower-Old Colony the presence of copper in the new vein encountered in the 1,700 level crosscut west of the shaft warrants the further opening of the lode. Drifting will be continued northward in the hope the vein will widen. The copper content at present is commercial, but the lode is too narrow for profitable operation.

If development work to the north ultimately proves to be discouraging, the vein will then be opened toward the south.

British Columbia Companies at Capacity Production

Total Ore Shipments This Year to Trail Smelter, 216,357 Tons on May 14

The large companies of British Columbia continue to produce at the full capacity of their respective plants. Granby Consolidated Mining, Smelting & Power Co.'s Anyox mill is now treating 2,750 tons of ore per day, and the resulting concentrate is sintered and smelted in blast furnaces with siliceous copper ore from the company's Hidden Creek, Outsider, and Golskeish mines. Two furnaces are in operation. Granby's Allenby mill is treating about 2,300 tons per day from the company's Copper Mountain mine. The resulting concentrate is treated at the Trail smelter, where a reverberatory furnace is being built specially for the purpose. Hitherto, Allenby concentrate has been sintered and smelted in a blast furnace with siliceous gold-copper ore from Consolidated's Rossland mines, but these mines now appear to be approaching exhaustion, development during the last two years having found little new commercial ore. The Granby company reports that its Anyox concentrator is saving 83.7 per cent of the copper content of the ore and the Allenby concentrator 79.85 per cent. Anyox makes a concentrate averaging 15.08 per cent of copper and Allenby one averaging 29.09 per cent.

Britannia Mining & Smelting Co.'s concentrator is treating about 3,300 tons of ore per day. Its mine is in excellent physical condition. The new deep-level tunnel, now nearing completion, is expected to reduce operating costs, especially during the winter months.

The Consolidated Mining & Smelting Co. of Canada's Sullivan mill is treating about 4,000 tons of ore per day. New 5,000 hp. steam turbo generators, which were erected late last year, are giving excellent satisfaction and are said to have already paid for themselves several times over. The company's St. Eugene mill, which was completed during the last year, is treating per day 500 tons of material derived from the old waste dump and tailing lake. Though no specific information has been given out as to recoveries, the company has announced that the results from the St. Eugene mill have far exceeded expectations, and, as a consequence, the St. Eugene mine is being explored to find if any ore commercial under existing conditions, though possibly not when the mine was being worked, was left in the old mine.

The Premier Gold Mining Co. is milling from 400 to 430 tons of ore per day and is shipping to the smelters from 150 to 175 tons of crude ore. The company has started to explore the Prosperity group and adjoining claims, in the Marmot River district, which it acquired under lease and option late last fall. It will be remembered that 30 tons of ore taken from a surface opening on the Prosperity group last year gave a smelter return of about $6,600.

Trail ore receipts for the present year up to May 14 totaled 216,357 tons, which is a large increase over the corresponding period of last year. The principal shippers were the Consolidated company's mines—chiefly concentrates from the Sullivan mill—139,789 tons; Granby company, Allenby, 13,584 tons of copper concentrate; Lucky Jim, Zincton, 8,091 tons; Bluebell, Riondel, 7,697 tons; Yankee Girl, Ymir, 7,759 tons; Last Chance, Republic, 7,095 tons; Quilp, Republic, 7,001 tons; and Whitewater, Retallack, 2,152 tons. It will be noticed that the mines at Republic, in the State of Washington, are shipping heavily. Ores from these mines, like that from the Yankee Girl, are dry silver-gold ores, and they get a special rate at the smelter on account of their fluxing properties.

The old Sheep Creek camp, near Nelson, which for many years was a prosperous gold camp, appears to be arising from its ashes. The Queen and the Kootenay Bell, both of which have been practically idle for about seventeen years, though a feeble attempt was made to revive them four or five years ago, are being reopened.

Spring has been unusually late this year. Consequently seasonal mining operations in the northern part of the province and at high altitudes in other parts have been late in getting started; in fact, up to the end of May comparatively little seasonal exploration and development has been done.

Labor conditions throughout the province are normal. There has been a little trouble among metal workers at Vancouver, but nothing of a serious nature is anticipated. There has been a little trouble, too, among some of the railways employees, but this, also, it is expected, will be amicably settled.

News From Washington

By PAUL WOOTON
Special Correspondent

Discussion of Tariff Revision Probable at Forthcoming Session of Congress

WHETHER OR NOT tariff revision can be avoided at the forthcoming session of Congress is problematical, but the U. S. Tariff Commission is not going to be found wanting if Congress should call for information. This is particularly the case with respect to those dutiable commodities which are certain to be assailed in the attack which certainly will be made on the present law.

Advocates of tariff revision regard the items covering certain of the mineral raw materials as weak spots in the law. On these items the commission will have full information. Every effort is being made to keep current the data on these and the other commodities which are likely to be attacked.

Because of their relationship to the national defence, and because production has not increased to an extent commensurate with the toll levied on consumers under the policy of aiding infant industries, it is clear that no opportunity will be lost at the "political" session to discuss the effect of those duties.

Among the commodities which are certain to be used as examples in efforts to secure the revision of the law, or to discredit it, are manganese ore, tungsten, quicksilver, and antimony.

The main contention is certain to be that it is not wise, in the development of a nation's natural resources, to raise the price artificially of mineral raw materials and thereby permit commercial exploitation of limited reserves.

The flexible provisions of the present tariff law are now being tested in the courts. An importer of barium dioxide, a commodity on which the rate of duty was increased from 4c. to 6c. per pound, has attacked the action as unconstitutional, claiming it is a delegation of lagislative authority. The Attorney General has just filed a brief with the Supreme Court in the case, contending that the tariff act does not delegate to the President the power to tax. "What the President is required to do," says the brief, "is simply in execution of the act of Congress. He is merely the agent of the law-making department to ascertain the facts prescribed by Congress and to declare the event upon which its expressed will is to take effect. The statute invests the President with no discretion or judgment in proclaiming the duty, but authorizes him to proclaim only the duty shown by a prescribed state of things or as shown by certain ascertained facts legislatively prescribed." Decisions of the Supreme Court are cited in support of the contention which the brief makes, and the Attorney General contends that "in the light of these authorities the case does not present a constitutional question differing in principle from that already decided several times by this court." Continuing the brief says:

"The contention of the petitioner that it appears on the face of the statute that it provides for a levy for trade advantage to particular citizens, and is, therefore, not a tax levied for the common defence and general welfare, is without merit. It might be contended with equal reason that every dutiable provision in a protective tariff act is designed to provide a levy for the trade advantage of a particular citizen or group of citizens. It is a matter of public history that many of our tariff acts, including the present one, have been affirmed on the underlying policy of protection.

"The validity of this statute is a matter not open to reasonable disputation. There is nothing to be gained by issuing the writ of certiorari for the purpose of affirming the judgment. For all proper purposes the denial of the question will set the question at rest."

Toronto Letter

By Our Special Correspondent for Northern Ontario

Clearwater and Narrow Lake Areas Active—Kirkland Rand Reorganizes

Power has been turned on at the Hollinger's copper properties in Kamiskotia and a start has been made on sinking the shaft. The company has installed a complete electrically driven plant, and will be able to carry on its preliminary development work to good advantage. The shaft will be sunk in ore consisting of finely disseminated chalcopyrite. Both the Noranda and McIntyre have optioned properties in the same section and are starting surface exploration work. A number of other interests are operating, and a large amount of work will be done during the summer.

The official report of the Vipond Mines, of Porcupine, for April shows that the company treated 8,009 tons and produced $59,800. For the quarter ending April 30 the production was $183,100 and the average recovery $7.92 a ton. This shows a comparatively small margin of profit.

In the Clearwater and Narrow Lake sections, northwest of Red Lake, there is a great deal of activity. Very encouraging surface assays have been obtained by the Pioneer Syndicate, and it is understood that drilling results on the Jackson-Manion group, which is under option to the Timmins interests, have been quite satisfactory. Men returning from the district within the last few days report that Hollinger men panned $1,000 worth of gold on a surface showing. A number of other properties are being opened up, but definite results are not yet available.

Several new discoveries have recently been made on the Amulet property in Rouyn, Quebec, and trenching with machine drills is joining up some of the surface showings previously found. It is understood that the heavy mineralization indicated by the electrical survey on the Area property is extending into the Amulet ground and that there is the possibility that ore may be developed where it approaches the area of mineralization on the Amulet in which these discoveries are being made. This area has been indicated by electrical survey on the Amulet and will soon be drilled.

The directors of the Lake Shore Mines, of Kirkland Lake, have declared the regular quarterly dividend of 10 per cent with an extra bonus of 10 per cent, payable June 15 to shareholders of record June 1.

On the Pawnee property, in Kirkland, good ore has recently been encountered on the 250 level. This property has been under option to several different interests during the last few years. Some diamond drilling had been undertaken by the Lucky Tiger company, but this was not considered sufficiently promising to continue work under the option agreement. On the 125 level the vein was drifted on for some distance, but values were found to be erratic. On the 250 level, however, much higher-grade ore has been found, although the amount of development work accomplished to date is limited.

Arrangements are being made to reopen the Kirkland Gateway mines. A syndicate has undertaken to raise $50,000 to do diamond drilling, and, if results are favorable, to resume underground work.

At the annual shareholders' meeting of the Tough-Oakes Burnside mine, all the old Canadian directors retired. The retiring directors are J. Y. Murdoch, president of the Noranda; F. H. Phippen and W. H. Beatty. The new board consists of W. H. Wright, of the Wright-Hargreaves mine; J. J. Gray; M. P. Vandervoort; A. Burt; Alan Stuart, manager of the property; George Young, and R. H. Gwyn Williams. Mr. Williams is an English engineer who was sent out by the Kirkland Lake Proprietary to report on the Tough-Oakes, and as a result of his report the English interests are advancing up to $250,000 for further development, of which a substantial amount has already been paid. The Kirkland Lake Proprietary is a large holder of shares in the Tough-Oakes Burnside.

A special shareholders' meeting of the Kirkland Rand has been called for May 31, in Montreal, to consider a proposal of the directors for the reorganization of the company. This involves selling to a new company having a capital of 3,000,000 shares of $1 par, of which 1,600,000 shares would be paid for the assets of the old company. These shares will be pooled for a period of three years. The board also proposes a debenture issue convertible into shares. Kirkland Rand has had a long but rather unfavorable history.

As reported some time ago, the Standard Stock and Mining Exchange of Toronto took action against some of its members for high-pressure methods in forcing the sale of speculative stocks. One of the brokers involved was Morgan U. Kemerer, who was suspended for sixty days and fined $100. Kemerer asked for and obtained an interim injunction restraining the board from putting the suspension and fine into effect. At the trial the judge upheld the action of the Standard Exchange. Kemerer stated that he had stopped the objectionable practices complained of by the exchange. The judge advised the members to try to settle their differences amicably.

High-Grade Ore Continues at Keeley Silver Mines

During April production of the Keeley Silver Mines, Ltd., South Lorrain, Ontario, amounted to 124,817 oz. of silver and 11,125 lb. of cobalt. The corresponding figures for the two preceding months are as follows: March, 125,250 oz. silver and 9,237 lb. cobalt; February, 124,822 oz. silver and 10,276 lb. cobalt. The extensive shoots of high-grade ore found on No. 2 vein in the western part of the property on the 820 level have been followed downward to the 895 level, and are now in progress of exploration at that horizon.

London Letter

By W. A. Doman

Special Correspondent

Russian Concessions Criticised—An International Control of Tin Rumored

London, May 17—As the Soviet representatives were permitted to attend the conference at Geneva, their attitude and utterances there have evoked a considerable degree of interest. They utilized the opportunity to air what they called their grievances, and in fact abused the occasion. A couple of points stand out prominently. The question of concessions was raised, and one of the Russians stated, evidently with great glee, that the Soviet had frustrated the Harriman concessionaire's hopes of establishing a monopoly when he secured the manganese deposits for exploitation, by reserving certain valuable fields for themselves, after which they were able to undersell the Americans. As this trickery has been publicly announced, it does not conduce to other parties putting up money for concessions. If a government cannot be trusted to deal honorably it must expect to have its claims upon the surplus wealth of other countries ignored. The matter has certainly not been overlooked in London, where funds can usually be obtained by honest borrowers. Another point that leaked out was that Russia is rapidly drifting back to private-ownership principles. The government still has concessions to give out, and desires to borrow three milliards of roubles on them. The Germans have been badly treated in the way of concessions, and as English capitalists have had their capital and properties confiscated, there is no rush of lenders either in London or Berlin. It was stated last week that the Midland Bank was about to lend Russia £10,000,000, but this has been denied.

For some weeks rumors have been in circulation that an attempt is to be made to obtain an international control of tin. It was said that Americans wanted it, though negotiations were in progress on this side. Color was lent to this rumor by a statement made at the annual meeting of shareholders in the Tavoy Tin Dredging Corporation, Ltd., when Sir W. D. Henry, the chairman, said that so long as the principal buying continued to be organized in two or three powerful hands, and hundreds of producers persisted in competitive selling, unstable conditions were inevitable. Now, however, that the fundamental principle, that strength is in combination, is at last beginning to be proclaimed, even on this side of the Atlantic, he was very hopeful that the paramount position which the British Empire enjoyed in tin production would at no very distant date be reflected in the better co-ordination of the producing interests.

Nothing further has been heard of the new tin-extraction process in Cornwall, and some scepticism is being expressed concerning it, according to advices recently received.

Melbourne Letter

By Peter G. Tait
Special Correspondent

Government Officials Await Proposals From Gold-Mine Operators

Melbourne, April 28—Under instructions from the commonwealth development and migration commission, of which H. W. Gepp is the chairman, a technical committee visited Western Australia in November last to report on the condition of the gold-mining industry. Though its report has been in the hands of the commission for four months, no announcement as to its nature or the intentions of the commonwealth government in regard to assistance has been forthcoming. The Western Australian Government has £165,000 earmarked for the purpose, but does not desire to take definite step until the commonwealth government decides on its course of action. C. S. Nathan, of Western Australia, who is associated with Mr. Gepp as a member of the development and migration commission, recently discussed the position with the premier of the state, who subsequently stated that the future of mining at Kalgoorlie and other centers is in the hands of the companies themselves. It would appear that the commonwealth and Western Australian governments are waiting for the Kalgoorlie companies to come forward with some proposal, but the indications in that direction are not favorable.

According to a report from London, a proposal submitted recently by the directors of the Golden Horseshoe mine for an amalgamation of the Golden Horseshoe, Great Boulder, Lake View, and Star mines was rejected by the boards of the two last-named companies on the ground that the conditions were too one-sided and unsatisfactory. As previously mentioned, the London directors of the Western Australia gold mines are not in the mood to consider schemes calling for heavy capital expenditure under present conditions, preferring to carry on so long as the income meets expenditure, and Richard Hamilton, late general manager of the Great Boulder, practically confirms this point of view. Rightly or wrongly, the companies feel that they have been unfairly treated in the past, and they are looking for a concrete scheme of assistance.

Measurements of gold-bearing wash available for sluicing on the original leases of Guinea Gold, N. L., New Guinea, have been made by J. C. Coldham. He estimates the Koranga section at 33,000 cu.yd., the Kaili section to the upper bank of Edie Creek at 1,000,000 cu.yd., and the lower end of the Kaili section at 37,000 cu.yd., or a total of 1,070,000 cu.yd. Mr. Coldham states that the working cost on the Kaili sections will be 11d. per cu.yd., and the secretary of the company adds that the cost on the Koranga section should be less than that figure.

It is reported that the Wiluna Gold Corporation of Western Australia will have 750,000 tons of ore, of an average value of 40s. per ton, opened up on two or more sides by the end of June. Development is proceeding at the 290 level, and it would not be surprising if the drive on payable ore at this level eventually reaches a total length of half a mile. Work is being concentrated on the lodes in the southern leases only at present. A pilot plant is at work testing various methods of treatment, and, as soon as a thoroughly successful method has been decided upon, it is understood that the Western Australian government will proceed with the construction of a railway line connecting the mines with the railway system.

The directors of Mount Isa Mines, Ltd., announced on April 21 that the Anglo-American Corporation of South Africa had informed them that it will not exercise its option over the additional 550,000 shares in the company. No reason has been given for this decision, though it is understood some doubts obtain as to a process for treating the large tonnage of ore believed to exist. The lapsing of the opinion naturally caused a heavy slump in the share market, and scrip which was selling 41s. 6d. during March dropped to 20s. The company is losing no time in making a further effort to interest investors in the property. W. H. Corbould is now en route to London to negotiate with several other groups that are said to be anxious to obtain options.

Promising Development and New Companies in Montana

In driving a crosscut north on the 500 level, the Butte Hill Copper Mining Co. encountered a vein one foot wide which is reported to have assayed 19 oz. of silver per ton and 10 per cent zinc. This is one of a series of east-west veins which show prominently on the surface. The company will drive east several hundred feet on this vein and then prospect both north and south to tap the other veins in the series. The property consists of eleven patented claims in the Walkerville district.

Butte Independent Mines Co. is completing a raise to the surface from its No. 2 winze, after which a contract will be let to drive the shaft on the Canadian claim from the 60 level to the 300-ft. point. This shaft is located on the Williamsburg vein in the southwest part of Butte and shows milling values of silver-zinc ore.

Through a deal made by C. R. Brazier, a Helena mining man, the Montana Idaho Mines Corporation, which has been operating in the Winston district for over a year, has purchased four patented mining claims known as the January group, adjoining its East Pacific group. During the last year the company has shipped a substantial amount of commercial ore from the East Pacific property, on which a mill and power plant is now being installed. As soon as the power plant is completed the company will start active development work on the new claims.

The North Butte Copper Corporation, of Helena, has been organized by A. B. Miller, Norman B. Holter, and Thomas A. Marlow.

Johannesburg Letter

By John Watson
Special Correspondent

P. Kovaloff Considers Future of South African Platinum Industry Precarious

Johannesburg, April 26—The annual meeting of the Rand Mines, Ltd., was held in Johannesburg on April 21, A. W. Rogers presiding. Reference was made to the recurrent shortage of native labor and to the inevitable contraction of the Witwatersrand gold industry as the older mines are worked out. In seeking opportunities for the investment of fresh capital, an important factor was the Union Government's attitude toward private enterprise, which, judged by recently proposed legislation, was not encouraging. Rand Mines, Ltd., now have interests in North Venezuela, Canada, and in the Anglo-Spanish Construction Co. Ltd. The retiring directors, J. L. Jourdan and E. G. Izod, were re-elected.

On the recommendation of Carl R. Davis, its technical director, the Anglo-American Corporation of South Africa, Ltd., has abandoned the option it held over a large parcel of Mount Isa shares.

The Cunard liner "Franconia" anchored in the bay at Port Elizabeth early on the morning of April 23. A large party, chiefly American tourists, spent the day in sight-seeing and were accorded a civic welcome.

Last week at Lake Mentz, near Grooff-Reinet, Cape Colony, four men entered the water-tower to turn on the water for an irrigation service. A hurricane-lamp was blown out, and, on striking a match to re-light it, an explosion took place, supposedly due to an accumulation of marsh gas. Two of the men, including the foreman, have died and the other two were badly burned.

The Beit trustees have offered to present to the Union and Southern Rhodesia a highway and railway bridge across the Limpopo River. The cost is estimated at £50,000. It is understood that the Union Government will extend the railway from Messina, Northern Transvaal, to the river, a distance of about 10 miles, and the Southern Rhodesian Government will carry the line a distance of about 1½ miles into its own territory to a site suitable for a railway station. The bridge, which is to be called the Alfred Beit bridge and on which no tolls will be levied, will be a memorial to the late Alfred Beit.

Professor P. Kovaloff, a Russian scientist, who has been studying the occurrence of platinum in South Africa, says the Russian output of crude platinum is now nearly 100,000 oz. per year, or approximately half the world's present consumption. In Russia, the crude platinum is refined in the Urals, and Professor Kovaloff is of the opinion that South Africa should establish a refinery here. He mentioned a recent drop in the price of platinum from £24 to £19 10s. per oz. The future of the platinum industry in South Africa he regards as precarious.

Societies, Addresses, and Reports

Capitalism and Communism at Grips in Geneva

By Edward J. Mehren
Vice-President, McGraw-Hill Publishing Company, Inc.

Geneva, May 9—The plenary sessions of the International Economic Conference are over for the present, and the committees on commerce, industry, and agriculture get under way this morning. The closing plenary sessions rivaled in interest the earlier ones, for they included the speeches most eagerly awaited—those by Henry M. Robinson, head of the American delegation; by the Russian delegates Sokolnikoff and Obolenski-Ossinski; by W. T. Layton, editor of the *Economist* and member of the British delegation, and by Monsieur Loucheur, of France.

It was an interesting group: Robinson, calm, judicious, gracious; Sokolnikoff, astute; Obolenski-Ossinski, so much of a youth as to appear out of place in this conference of mature men, but challenging with communistic doctrine the economic structure of all other nations represented; Layton, carrying all with him through the incisiveness and convincing character of his analysis and deservingly earning the most prolonged applause in the four days' sittings; Loucheur, the only real orator in the four days, pleading, cajoling, defending, appearing from his manner to be saying a great deal more than he did.

Robinson Speaks for America

What would be America's view of the various proposals was the constant query of the first two days; and when it came none could want a clearer statement than Mr. Robinson's. The American believed that the actual level of tariffs are less of a barrier to trade than lack of stabilization of tariffs, abrupt changes in duties, lack of definiteness in classification and terminology.

In maturing methods for mitigating those difficulties the conference might help.

The American delegation, he indicated, would not oppose the international cartel idea as such, but would disapprove government participation in cartels and insist that they must not exploit the consumer. He sketched briefly and clearly the development of the American industrial system and accounted for our present prosperity by improvements made in management practice, by elimination of waste, by lavish use of machinery, and full interchange of information on production and trade methods. He indicated that the tendency of management now was to secure needed economies by bettering its practice, eliminating waste, and introducing more and better machinery, rather than to attempt to attain its objectives by wage reduction.

Relations between employers and workers are quite happy; both groups subscribe to the doctrine of more effective production as the basis of prosperity, while every enlightened self-interest urged them to continue developments in the same general direction.

Mr. Robinson, I said, was calm and gracious, but while continuing so he showed that there was fighting reserve if need be. Sir Max Muspratt (Great Britain) had said that there was no discrimination against America in the rubber exportation restriction, since all nations were treated alike. Mr. Robinson remarked that he could not follow the argument when a non-producing country (America) took 75 per cent of the production while the country which controlled the restrictions consumed only 7 per cent of the supply.

The speech was well received, and comment on it indicated again the opinion in Europe that we are the darling of the gods. They are trying to grasp our secret, they doubt that the methods are applicable here, but they vaguely realize that in some way they have to grow into an industrial practice approximating ours.

Russia Speaks

But if Mr. Robinson received close attention the interest was intensified when Sokolinkoff arose. Delegates massed solidly around the tribune to catch every word. What would a new social order say to the old? What message did the Union of Soviet Republics have for the capitalistic world?

But there was disappointment. There was only one message for the capitalistic world: "Come and trade with Russia. We welcome foreign capital. The capitalistic and communistic social systems are different, but they can work together."

The remainder of the address was a defence of the communistic order and the painting of a laudatory picture of Russian progress. He contended that agricultural and industrial production were above pre-war figures called into question later by Loucheur and mistrusted generally here. The masses were being cared for. There was no favoritism to any group in the community.

Sokolnikoff having failed to reach expectations, rumor soon had it that his colleague, Obolenski-Ossinski, head of the delegation, would fire the hot shot. And he did. He raked the capitalist system fore and aft, accused it of anomalies, of causing the World War, of impotence to handle the economic situation effectively.

Even the most ardent apostle of "capitalism rampant" had to admit that some of his criticism caught chinks in the armor of capitalistic states, though he failed to carry conviction that communism's armor was free from flaws, or that the communistic system had handled or could handle the present economic situation more effectively. He cited, for example, the discrepancies in the well-being of the workers of different nations, the large unemployment in certain countries, the overcapacity of industry, the discrepancy between production and consumptive power, the lengthening of working hours even where there is unemployment, and the discrepancy between the returns of agriculture and industry. He doubted the effectiveness of international cartels, and while he pleaded for co-operation of the communistic and capitalistic systems he intimated that their coexistance was only temporary, possibly implying that one of the systems was doomed to disappear.

As a transitional plan he suggested eleven steps for the re-establishment of trade: (1) Cancellation of war debts; (2) increase of wages of industrial workers; (3) introduction of the eight-hour day for all workers, with six hours in mines and "similar industries"; (4) fullest liberty for trade-union organizations and complete liberty for strikes; (5) "real" measures for relief of unemployed; (6) raising of unemployed relief funds by taxation; (7) decrease of unproductive expenditure, particularly in armaments; (8) abolition of all barriers against emigration and immigration; (9) cancellation of all systems of protectorates and mandates and recognition of rights of all peoples to self-determination; (10) suspension of all measures of intervention in China; and (11) suspension of all measures of economic boycott against Russia and re-establishment of relations with her so that she can obtain credit needed for her development, the capitalists in turn securing concessions.

Undoubtedly his speech and that of his colleague were so eagerly awaited because it is appreciated here that a Russia opened for full trade would be an important factor in European trade and industrial recovery.

His speech did not go unnoticed, for Signor Belloni (Italy) declared it self-contradictory, asking, pointedly, in regard to its demand for complete freedom for labor-union organization and liberty to strike, whether these privileges were accorded in Russia.

Layton's Searching Effort

An outstanding effort was that of Mr. Layton, and the audience was quick to respond to his searching analysis and clear and convincing exposition. He pointed out that despite the recovery of European production in 1925 to 104 per cent of pre-war, and trade to 94 per cent, there were 10,000,000 men out of work. But it was false, he maintained, to strive to return to the pre-war status. A new status, a "new equilibrium," is needed, due to the following new conditions:

1. The great increase in industrialization in all countries—a continuation of tendencies visible before the war but much accelerated by the conflict.

2. The development of the United States into a creditor nation, but under conditions different than that of previous capital exporting nations; for while Great Britain, for example, as an exporter of capital, had had a surplus of imports, buying goods from countries she financed, the United States was taking steps to keep out

the products of countries she was helping to develop or restore.

3. Alteration in emigration.

4. Alteration of trading relations, due to settlement of reparations and international indebtedness arising out of the war. Debtors had to develop an export surplus and creditors to accept an import surplus.

5. The large shrinkage in Russian trade.

6. Division of Central Europe into small economic and political units. New tariff walls to the length of 11,000 kilometers have been erected, there has been a large waste of capital through duplication of plant as between these countries and a reduction in volume of trade between the fractions of the old Austro-Hungarian empire and between them and contiguous countries, making necessary difficult trade divisions and adaptations.

The splitting up and duplication of plant run counter to the sound tendency toward consolidation and specialization which have brought such prosperity to the world. Small economic units, he remarked, were an anachronism. He declared that plans to meet the new conditions must be based on these fundamental but very simple principles:

1. The interdependence of the nations of Europe is so close that their economic prosperity must rise or fall as a whole; no nation in the long run can be prosperous through its neighbor's misfortunes.

2. Material well-being can only be achieved by economic production; permanent prosperity will never be achieved within by industries or by communities which pursue a policy of trying to make profits by restricting production.

3. Europe can keep abreast of industrial progress only if her economic organization permits of specialization, not merely between businesses but between nations. This requires substantial reductions in existing tariffs, so that the tide of international trade may flow in greatly increased volume.

He favored development on an organization for continued collaboration on these economic problems.

In General

The summaries of these addresses of these first four days indicate generally the consensus of opinion of the delegates and foreshadow the conclusions that may reasonably be expected in the ultimate resolutions. Surely the world will not lack now for an understanding of its economic difficulties.

Chief unanimity is found in the thesis of the interdependence of nations, particularly of those in Europe. At the same time nationalism asserts itself, the small nations, for example, demanding that they be not exploited by international combines of the greater nations, and Italy giving notice that if her people cannot emigrate she will have to set up tariffs to develop new industries for keeping her people employed.

Second in order is agreement that tariffs must be stable and that customs nomenclature and classification must be simplified and standardized. Theoretical statements are common to the effect that tariffs must be lowered, though one detects reservations and hedging. But such reduction would seem a logical tendency after the easier remedies had been applied and had been operative for a number of years.

On the third most important point, the advisability of international industrial combines, selling agreements, etc., covered by the term cartels, there is hardly unanimity. In general they are accepted as a sound and logical international development rising out of international industrial consolidation. But there are reservations of many kinds. The Americans will disapprove if governments are participants in these international combines if they are exploitive. The socialist and Christian labor unions and Loucheur demand some sort of control mechanism to prevent exploitation of workers and consumers, Loucheur's scheme being a bureau of information, observation, and publicity. The non-industrial nations fear exploitation by the industrial powers working in concert. Italy fears their effect in the crystallization of industry, due to a lack of competition, and emphasizes the harmfulness of such crystallization to the nations which "have not yet completed their economic industrial growth."

So while agreements may be looked for on removal of trade barriers, action on international cartels is problematical. Another week will tell the tale.

Recommendations of Committees Given Final Approval

Special Cabled Report

Geneva, May 21—The recommendations of the Economic Conference for restoring the economic health of the world, particularly that of Europe, all of which had been approved by the committees, were given final approval in the general session held on Tuesday, May 17. The resolutions on industry cover rationalization, industrial pools, and statistics.

The recommendation on rationalization—that is, the application of all devices for reducing costs—urged that labor should co-operate to secure good working conditions and a fair share in the results. It also advised occupational selection, guidance, and training for labor. There was further recommended a national and international standardization program for materials, parts, and products to facilitate international trade. Education of manufacturers' workers regarding the advantages of rationalization also was urged.

Disagreement was quite general with regard to national and international industrial pools. They were believed to be good or bad according to results and their regard for the general interest. Their field of application is limited to branches of production already centralized and to products in bulk or of recognized grades, so that cartels alone are not able to remove European troubles. Where they are applicable, however, they secure more methodical organization of production, reduce costs through better utilization of existing equipment, and develop new plants along better lines. Such group undertakings more rationally check uneconomic competition, reduce evils of fluctuating industrial activity, and thus assure greater stability of employment. They also reduce production and distribution costs, making for lower selling prices, and thus benefit the consumer. However, if pools encourage monopolistic tendencies and the application of unsound business methods they may check technical progress and incorporate dangers for the public. If pools are resorted to, they must not injure either the consumers or the workers nor restrict the supply of raw materials or basic products to any particular country. Neither should they create unequal conditions between the finishing industries of consuming and producing countries.

In connection with industrial statistics, the conference recommended that international statistics be compiled on the supply of raw materials, on output, stocks, prices, wages, and employment. It recommended a standardization of terms, methods, and scope, to begin with the basic world industries and those raw materials in which world shortage is anticipated. A continuation of the League's review of changes in world production and trade was also recommended.

The resolutions on commerce were very long and deserving of careful study by all interested in foreign trade. They condemn export and import prohibitions and special privilegies granted to state enterprises. The conference recommended a liberal policy toward foreign nationals and companies engaged in commerce and urged a simplification of customs and tariffs and a standard nomenclature. The stabilization of tariffs by means of long term treaties, referring chiefly to European countries, was also recommended. It was declared that hampering tariffs should be reduced, starting with those imposed to counteract the effects of war disturbances. It was recommended that the exportation of raw materials be not burdened by export duties and that such duties where necessary should not discriminate between different countries. Commercial treaties should contain an unconditional most-favored nation clause in the broadest and most liberal form. A uniform interpretation of said clause was urged.

All direct and indirect subsidies to home industries were condemned and dumping was declared harmful and out of all proportion to any temporary advantage from cheap imports.

Because American public opinion is opposed both to governmental participation in industry and to monopolistic tendencies, American delegates stated that while not opposed to resolutions on industrial pools they would abstain from voting thereon. There were no criticism or animosity to America and no evidence of a European combine against America. The contribution of American delegates was much appreciated, for they took the position that they were here to help give the data requested regarding our experiences, but not to tell Europe what to do.

Recent Technical Publications

Reviews, Abstracts, and References

Tables of Physical and Chemical Constants. By G. W. C. Kaye and T. H. Laby. Fifth edition. Longmans, Green & Co., 55 Fifth Ave., New York City. Price $4.75.

This book contains a large amount of tabular data on the constants used in the solution of problems on heat, light, sound, electricity, magnetism; rays, radio-activity, and gaseous ionization; and chemistry. The latest edition contains new matter on isotopes and the mechanical equivalent of heat, with corrections of errors made in former editions. A valuable reference book for the research worker.

Mineral Resources—The following separates of "Mineral Resources of the United States, 1925," have recently been issued by the U. S. Bureau of Mines and may be obtained from the Superintendent of Documents, Washington, D. C., at the prices quoted: "Lime in 1925," pp. 12, by A. T. Coons, 5c.; "Manganese and Manganiferous Ores in 1925," pp. 38, by J. W. Furness, 10c.; "Mica in 1925," pp. 13, by W. M. Myers and B. H. Stoddard, 5c.; "Natural Gas in 1925," pp. 8, by G. R. Hopkins, 5c.; "Natural-Gas Gasoline in 1925," pp. 6, by G. R. Hopkins, 5c.; "Salt, Bromine, and Calcium Chloride in 1925," pp. 15, by A. T. Coons, 5c.; "Secondary Metals in 1925," pp. 21, by J. P. Dunlop, 5c.; "Talc and Soapstone in 1925," pp. 11, by B. H. Stoddard, 5c.; "Gold, Silver, and Copper in South Dakota and Wyoming in 1925," pp. 5, by C. W. Henderson, 5c.; "Phosphate Rock in 1925," pp. 18, by W. M. Weigel and B. H. Stoddard, 5c.

Heavy Liquids in Mineralogical Analyses—A bulletin with this title, prepared by John D. Sullivan, was recently issued as Technical Paper 381 of the U. S. Bureau of Mines, pp. 26. The purpose of the investigation described was to develop a series of heavy liquids for use in mineralogical analyses—to get a series of cheap liquids that would enable one to separate by means of the sink-and-float method the heavier mineral particles from the gangue and, if possible, to separate the various minerals from one another. The investigation consisted largely in a study of the liquids already in use and the development of other suitable liquids. Copies of the paper are obtainable for 10c. each from the Superintendent of Documents, at Washington.

Economic Geology—The May issue of *Economic Geology* (Lancaster, Pa.; price 75c.) contains the following papers: "Minerals in Relation to Possible Development in the Far East," pp. 17, by H. Foster Bain; "Fractionation and Decomposition of Petroleum in Capillary Migration," pp. 3, by C. W. Cook; "Relations of Oxygen and Sulphur Minerals in Ore Deposits," pp. 13, by B. S. Butler; "Origin of the Vermont Talc Deposits," pp. 42, by J. L. Gillson; "Equilibrium Relations of Pyrrhotite and Pentlandite," pp. 12, by W. H. Newhouse.

Gas Measuring Instruments—A general knowledge of the various instruments for measuring gases and gas flows is often useful to mining and metallurgical engineers, who will be interested in a circular recently issued by the U. S. Bureau of Standards on this subject. Definitions of the more important terms commonly used in gas measurement and a classification of the instruments and methods of measurement used are given. There follows a description of the construction and operation of the instruments and an outline of the methods. In many cases methods of testing and adjusting the apparatus are given in detail and the important points to be watched in such work are mentioned. In the case of velocity or inferential meters, such as the orifice meter or Venturi tube, the general equation of flow is stated and its derivation indicated. Requests should be addressed to the Superintendent of Documents, Washington, D. C., for Circular of the Bureau of Standards, No. 309. The price of the circular is 40c.

Mining in Peru—What constitutes a handbook of Peruvian mines has been received from the Bureau of Mines and Petroleum at Lima. It is entitled "Morimiento Economico de la Industria Minera del Peru en 1924," and is in three parts: Part I, Metal Mines; Part II and III on fuels and non-metallic minerals. Mines are classified by departments and districts. General data as to the year's operations are given including production figures.

Another pamphlet, No. 13, the "Official Bulletin of Mines and Petroleum," summarizes the developments in the mining industry in Peru in 1925.

Gears and Speed Reducers—The application of gears and speed reducers on motor drives discussed in a 6-page article in *Industrial Engineer* for April (McGraw-Hill Publishing Co., New York; price 25c.) is one of a series in which the various methods and equipment used in connecting a motor to its load have been thoroughly covered. In this article the principles that should be observed in laying out gear drives are discussed at length, and the various types of so-called speed reducers and their application under different service conditions are described.

Belt Drives—Research Bulletin R-16 of the Leather Belt Exchange Foundation, Cornell University, presents a study of the transmission capacity of horizontal quarter-turn drives, compared with normal horizontal drives. Copies of the bulletin may be obtained free on request to the Leather Belting Exchange, 119 South 4th St., Philadelphia. Pa.

English Mining Report—The fifth annual report of the Secretary for Mines, for the year ended Dec. 31, 1925, and the annual report for the Chief Inspector of Mines for the same period, pp. 212, is now available for 6s. from H. M. Stationery Office, London, W. C. 2, England.

Canadian Geology—The Geological Survey of Canada announces the following recent publications: Economic Geology Series 3, "Iron Ores of British Columbia, and Yukon," by C. A. Young and W. L. Uglow; Map 190A—Nottaway sheet, geology of western Quebec between the Canadian National Railway and Rupert River; Map 2107—Chipman sheet, geology; Map 2108—Minto sheet, geology; Map 2094—Chipman sheet, topography; Price 10c. Applications for the publications should be addressed to the Director, Geological Survey, Ottawa, Canada.

Blasting to Avoid Boulders—"Blasting to Lessen Boulders in Hard-Ore Stopes" is discussed by E. D. Gardner and S. P. Howell in U. S. Bureau of Mines Technical Paper 383, pp. 23. Breaking up boulders by hand is troublesome and expensive, and miners will be interested in methods used to prevent their presence. Copies are obtainable for 10c. each from the Superintendent of Documents, Washington, D. C.

Birmingham Iron Ore—Technical Paper 379 of the U. S. Bureau of Mines, pp. 24, by W. R. Crane, is entitled "Strength of Ore and Top Rock in the Red Iron-ore Mines of the Birmingham District, Ala." This paper gives the result of a study made chiefly to determine the size of pillars adequate to support the roof as the mines in the district grow deeper. Copies of the bulletin are obtainable for 10c. each from the Superintendent of Documents, Washington, D. C.

Drilling in Russia—The research drilling work on the iron ore in the region of the Kursk Magnetic Anomaly and its organization and performance are described in a bulletin recently issued by the Soviet Government. Though most of the text is in Russian, there is a summary of several pages in English. Copies are obtainable from the U. S. S. R. Society of Cultural Relations, Moscow, U. S. S. R.

Explosives—U. S. Bureau of Mines Technical Paper 406, by William W. Adams, is entitled "Production of Explosives in the United States During the Calendar Year 1925, With Notes on Mine Accidents Due to Explosives." The bulletin includes a list of all manufacturers of explosives in the United States in 1925. Copies are obtainable from the Superintendent of Documents, Washington, D. C., for 10c.

Antimony—A comprehensive article on the subject of antimony, by W. V. Smitheringale, appears in the April issue of *The Canadian Mining and Metallurgical Bulletin* (Drummond Building, Montreal; price $1). The paper, which occupies 54 pages, is an outline of the geology of the world's antimony deposits and a proposed classification; with a discussion of the properties and uses of antimony and its compounds.

Endurance of Metals — Publication No. 13 of the Engineering Foundation, pp. 63, "Endurance of Metals Under Repeated Stress," by H. F. Moore, presents a condensed statement of the recent knowledge of fatigue of metals. Copies may be obtained for $1 from the Engineering Foundation, 29 West 39th St., New York, N. Y.

Personal Notes

S. M. Soupcoff, engineer for the A. S. & R. Co., is in New York.

B. F. Tillson, superintendent of the New Jersey Zinc Co., is visiting mines in the Southwest.

Samuel Frankel has been appointed chief metallurgist of the Niagara Falls Smelting & Refining Co.

E. E. Whiteley, assistant manager of Calumet & Arizona, has returned to Arizona from New York.

J. E. Spurr and Mrs. Spurr have returned to New York after a six weeks' tour of northern Europe.

Charles A. Mitke has returned to Phoenix, Ariz., after an extended professional trip in the East.

George Ireland, boring engineer in the Department of Irrigation, has returned to Pretoria from Capetown.

H. Robinson Plate, consulting engineer, has entered the firm of George D. Roberts, bankers, of San Francisco.

George W. Lambourne, president and general manager of the Park Utah Consolidated Mines Co., is in New York.

A. G. MacGregor is leaving Arizona for South Africa, to make preliminary surveys regarding mill and smelter construction.

C. P. White, chief of the economics branch of the U. S. Bureau of Mines, was in Salt Lake City recently on official business.

M. W. Woolley, manager of the ore purchasing department of the U. S. S., R. & M. Co., is on a tour of Nevada and California camps.

Henry Wyman, general manager of the Minerva Mining Co. at Asientos, Aguascalientes, Mexico, is in New York on business for the company.

Alexander Anderson, mining engineer of Fullerton, Calif., and inventor of the Anderson oil-well survey apparatus, is on a business trip to Europe.

D. D. Muir, Jr., manager of the U. S. S., R. & M. Co., has returned to Salt Lake after an inspection of Colorado operations at Eureka and the Sunnyside mine.

Philip Coldren, editor of the *Joplin Globe* and correspondent for the *Engineering and Mining Journal* in the Joplin-Miami district, has been in New York.

H. W. Hardinge has been awarded the Edward Longstreth medal by the Franklin Institute of the State of Pennsylvania for his invention of a rotary air classifier.

Philip R. Bradley, mining engineer of San Francisco, has gone to the Sudbury properties of the Treadwell-Yukon Co. and from there will travel to Juneau, Alaska, via Kellogg, Idaho.

C. Matzel, chief metallurgical engineer for the Krupp interests, has returned to New York, whence he will embark for Germany after visiting the chief steel and mining centers of the United States.

A. M. Morris, who has been the manager of the Bunker Hill Mine of Tombstone, Ariz., owned by the Phelps Dodge Corporation, resigned recently. He has been succeeded by **F. H. Soderstrom,** of Bisbee.

A. Warner Hooke, an Australian who has been associated with Nigerian tin mining for some years, is now in charge of the Federation Tin Mine, Heemskirk, Tasmania, which was recently taken over by a London company.

E.L.DeGolyer

E. L. DeGolyer, vice-president of the Amerada Petroleum Corporation and president of the American Institute of Mining and Metallurgical Engineers, recently made a trip from New York to Houston, Tex.

R. L. Chase will be in Colorado the months of June and July on examination work in the San Juan district. During this period he may be reached best by addressing care of Tyson S. Dines, First National Bank Building, Denver, Colo.

Frederick Laist, metallurgical manager of the Anaconda Copper Mining Co.; **Wilber Jurden,** construction engineer, and **C. D. Woodward,** electrical engineer, recently spent several days in Salt Lake City, inspecting operations at the Tooele plant.

G. C. Riser, superintendent of mills; **W. F. Remington,** superintendent of construction, and **Harry Moore,** metallurgical engineer of the Nevada Consolidated Copper Co., visited Salt Lake recently to study operations of Salt Lake valley plants.

Julius Loeb, vice-president of the American Metal Co., is sailing on the "Deutschland" on June 9 for Europe. He will be gone three months. Unlike many travelers abroad he frankly states that his mission is pleasure, with no intermixture of business.

Mrs. Herbert C. Hoover, who recently was in Butte, Mont., in connection with her work as vice-president of the Girl Scouts of America, stated that the many gallows frames and the general mining setting of Butte "looked like home to her."

M. E. A. Hinds, of the department of geology, University of California, is making a geological survey of the Weaverville Quadrangle, in Shasta and Trinity counties, Calif., and expects to complete the work in the course of several summer interims.

A. L. Stirton, underground manager at Langlaagte Estate, was recently presented with a safety-first certificate, a suitcase and a cigarette-case, this mine having headed the list for 1926, in the safety-first competition of the Prevention of Accidents Committee.

John Martin occupied the chair at the annual meeting of Modder "B" Gold Mines, Ltd., on April 22, and paid a tribute to Sir Evelyn Wallers, who had been chairman of that company for eleven and a director for nineteen years.

E. D. Gardner, supervising engineer of the U. S. Bureau of Mines station at Tucson, Ariz., recently visited the Cripple Creek district in connection with the investigations being conducted by the Bureau of drilling and blasting in metal mines.

Major T. H. Vincent, formerly associated with the British-Mount Zeehan Mines, Tasmania, left for London recently en route to northern Nigeria. He will prospect various mining properties on behalf of the Austral-Nigeria company recently floated in Hobart, Tasmania.

A. J. Delruelle, son of the president of the Société Metallurgique de Frayon, Inc., Belgium, was among the recent foreign visitors studying methods used in the plants of the Anaconda Copper Mining Co. Before returning to Belgium he will visit other zinc plants in the United States and Canada.

Obituary

Frank Anderson, Salt Lake engineer, prominent in intermountain mining affairs, died on May 21, at Salt Lake City. Mr. Anderson was born in Salt Lake on Dec. 23, 1868. He attended Salt Lake public school and later went to Ann Arbor, Mich., where he received his engineering degree from the University of Michigan. A leading part in the development of a number of Utah's largest producers gave Mr. Anderson a knowledge of mining and geology which made him a prominent figure in several big apex suits. At the time of his illness he was engaged in professional work at the Mammoth Mining company. Mr. Anderson is survived by his widow and a daughter, Betsy, and a son, Robert.

George Williams, eighty-two, pioneer prospector of Arizona and New Mexico, and one of the first press telegraphers in the United States, died recently at Clifton, Ariz., from exposure and old age. He was born in Cincinnati, Ohio, and worked as a telegrapher in his youth. In the early days of the Black Hills mining excitement, Williams went to Dakota. He moved to Silver City, N. M., in 1880, coming to Clifton in 1885, and had spent the better part of the time since his arrival in mining and prospecting. He was associated with Mason G. Greenlee, for whom Greenlee County was named. On May 3, Williams was found alone and unconscious in his cabin 6 miles up the San Francisco River from Clifton, by Colonel Del M. Potter, who took him to the hospital.

Market and Financial News

Sharpe Says Europe Is Amazed at Policy of American Zinc Miners

SINCE my notes a month ago the Chinese situation has brightened, says A. J. M. Sharpe, foreign correspondent of the American Zinc Institute, in his review of the zinc industry as of May 1. At the same time trading with China, and also with Japan since the financial crisis arising out of the failure of one of the largest Japanese merchant houses, continues to be paralyzed. This Far Eastern business affects zinc to a much smaller extent than lead because there is not nearly as much zinc imported as of the softer metal. Nevertheless, markets in both are so allied that a slump in one is immediately reflected in the price movement of the other. Thus, when lead became top-heavy, through the diversion of supplies to Europe which would ordinarily have been absorbed in the Far East, the zinc market could not stand alone.

On the first day of April, continues Mr. Sharpe, slab zinc was quoted in London at £29 13s. 9d. for current month's shipment and £30 5s. for the third month's shipment, and on the last day the respective quotations had declined to £29 2s. 6d. and £29 5s. At these reduced rates the downward movement was arrested and the tone since the turn of May has been distinctly better. Indeed, several factors and most of the producers are confident that the prices ruling at the end of April are as low as slab zinc is likely to sell at for some time to come. Probably the smelters are influenced in adopting this view by producing-cost considerations.

European production of zinc certainly is being maintained, but so is consumption. That this is so is evidenced by the fact that stocks are not increasing.

Zinc interests in Europe are amazed at the course of events in the United States, in that they cannot understand why producers do not come together and agree on a common policy of curtailment so that domestic output is kept strictly within bounds of domestic consumption. After the arrival of each monthly set of statistics from New York there come cables to London intimating that such a policy is already in vogue and that the statistics at the end of such month will afford proof. Actually, this regular cabled advice is stultified by the monthly details. British smelters last month produced 3,750 long tons, this output passing regularly into consumers' hands as they are favorably situated geographically to consuming centers; but they are, of course, not happy with the low price level now ruling.

Mr. Sharpe estimates world stocks of zinc on May 1, 1927 in metric tons as shown in the accompanying table at the top of the page.

Estimated Zinc Stocks

United States	37,500
Canada	3,200
Australia (including unsold shipments afloat)	2,800
Germany-Poland	6,600
Belgium	3,100
France	1,500
Great Britain	1,400
Scandinavia	200
Far East	500
Elsewhere	1,700
Total	58,500

Statistical Notes

Montecatini, by far the largest Italian mining company, has just published its annual report. It contains some interesting data about the Italian mining industry. We abstract the following: The Italian production of pyrites amounted in 1926 to 530,000 tons, and that of the Montecatini alone to 416,000 tons, against 372,000 tons in the preceding year. In addition the Montecatini still imported 81,000 tons of pyrites from Spain, which was practicable because of the low shipping rates. Production of lead ores in Italy in 1926 amounted to 54,000 tons and that of zinc ores to 173,000 tons. The Sicilian sulphur production, however, has largely decreased, from 500,000 tons in 1900 to 200,000 tons in 1926. Aluminum was produced to the amount of 2,000 tons, and 5,000 tons of metal was imported.

Quincy Mining Co. for the year ended Dec. 31, 1926, shows gross receipts of $1,922,073, against $2,118,875 in 1925. It produced 517,900 tons of copper rock and mass copper which yielded 25.66 lb. of refined copper per ton, the highest average for the last twenty years. Total output came to 13,290,052 lb. of refined copper, including 1,426,400 lb. recovered from the regrinding sections of the stamp mill. The loss for the year is to be attributed largely to cost of new surface and underground equipment and the cost of a much larger amount of underground development.

Mexican Corporation reports from its Fresnillo operations for the first quarter of 1927 the milling of 257,698 tons of oxide and 33,378 tons of sulphide ore. Bullion and concentrates brought $974,731, and after deducting $920,291 as "working expense" an operating profit of $54,440 remained. At the Teziutlan property the operating profit from 15,976 tons of ore was $60,700.

Cadmium production in the United States during the year 1926 increased 60 per cent according to the following figures from the U. S. Bureau of Mines:

Year	Pounds	Value Total	Value Average per Pound
1922	131,590	$143,433	$1.09
1923	183,816	161,758	0.88
1924	129,328	77,597	0.60
1925	502,824	276,553	0.55
1926	810,428	429,527	0.53

In addition to metallic cadmium, domestic manufacturers reported some production of the following cadmium compounds: Cadmium sulphide, cadmium hydrate, cadmium oxide, and cadmium lithopone. Figures are not available for publication.

Nevada Consolidated Copper Co. reduced its rate of production from 20,877,495 to 19,313,598 lb. of copper per month in the first quarter of 1927. The lower price for copper also affected earnings as indicated in the accompanying table.

Nevada Consolidated Earnings

	First Quarter 1927	Fourth Quarter 1926
Operating profit from copper production	$1,514,336	$2,121,354
Value of precious metals	260,884	237,133
Miscellaneous revenues, including income from subsidiaries	272,485	223,882
Total operating income	$2,047,707	$2,582,371
Depreciation	423,903	392,359
Net income	$1,623,803	$2,190,011

The net cost per pound of copper produced, after crediting revenue from gold and silver and other miscellaneous earnings and income from subsidiaries, was 9.43c., compared with 9.68c. for the fourth quarter of 1926. These costs include all operating and general charges of every kind except depreciation and reserve for federal taxes.

Diamond production in the Union of South Africa established a new record in 1926, reaching 3,217,966 carats, the increase being primarily due to the discoveries in the so-called alluvial fields. Production from the three big mines is closely controlled and depends upon the world demand; the only uncontrolled source of diamonds is in the alluvial deposits in parts of the Cape Province and the Transvaal. For several years the diamonds obtained from this source have never exceeded 200,000 carats, but discoveries in the western part of the Transvaal in 1926 brought the production steadily up, until in October it exceeded 120,000 carats. The total for the year came to 808,329 carats, valued at $3,983,681.

U. S. Sulphur Statistics in Long Tons

	1926	1925	1924	1923
Production	1,890,057	1,409,240	1,220,561	2,036,097
Domestic shipments	1,495,721	1,229,488	1,055,531	1,146,316
Exports	576,966	628,482	481,814	472,525
Stock Dec. 31	2,060,000	2,250,000	2,700,000	2,900,000

Michigan Copper Mines Realized 2.35c. per Pound in 1926

ONLY four mines in the Michigan copper country were operated at a profit in 1926, but the average realization was 2.35c. per pound, according to L. P. Barrett, state appraiser of mines of Michigan. Michigan copper production in 1926 was 175,441,565 lb., or an increase of 20,642,318 lb. over 1925. This is the largest output the district has had since 1919, when 178,365,000 lb. was produced. The average price per pound received for copper in 1926 was 14.18, against 14.28 in 1925. The average price received for the last five years is 14.04c. per pound.

Total production cost per pound of Michigan copper in 1926 was 11.84c. which compares with 12.556c. in 1925. This figure includes both mines and reclamation. For the mines only, the cost was 12.592c. in 1926, against 13.395c. in 1925. The principal reduction in costs came about through savings in overhead resulting from increased output and also a notable decrease in milling and smelting costs. Average profit per pound in 1926 was 2.35c., against 1.76c. in 1925.

The profitable operations in 1926, as in 1925, were the Ahmeek, Mohawk, Champion, and Isle Royale mines and the Tamarack and Calumet reclamation plants. Output from the remaining mines was obtained only at a net loss. Last year the unprofitable producers accounted for 60,133,157 lb. of copper, or 34 per cent of the total production. These same mines gave work to slightly over 40 per cent of the labor employed in the district. Of this total of unprofitable production, 36,000,000 lb., or a little over half, comes from the Conglomerate and Osceola lodes of Calumet & Hecla Consolidated, and these two operations are the only ones which give much promise of eventually lowering costs below 14c.

Valuations of mines in the Michigan copper district as recommended to the state appraiser of mines, are as follows:

Houghton County

Calumet & Hecla Consolidated Copper Co.	$12,945,000
Copper Range Co.	3,800,000
Isle Royale Copper Co.	1,325,000
Quincy Mining Co.	1,150,000
Arcadian Consolidated Copper Co.	122,000
Franklin Mining Co.	$135,000
Mayflower-Old Colony Copper Co.	90,000
Hancock Consolidated Mining Co.	54,000
LaSalle Copper Co.	90,000
Superior Copper Co.	22,000
Winona Copper Co.	80,000

Keweenaw County

Calumet & Hecla Consolidated Copper Co.	6,700,000
Mohawk Mining Co.	2,108,000
Seneca Copper Mining Co.	875,000
Total	$29,497,000

Granby Consolidated Mining & Smelting Co. reports for the first quarter of 1927 net profits of $293,948, compared with $429,598 in the corresponding quarter of 1926. Production averaged 4,521,197 lb. per month, this figure including Allenby as well as Anyox output. The average cost per pound was 10.374c. compared with 10.0c. in the first quarter of 1926. This includes all operating and general charges and deductions for precious metals and miscellaneous income.

Ahumada Lead Co. for the quarter ended March 31, 1927, reports a net income of $175,142 after depreciation, taxes, and other charges. This compares with $363,837 in first quarter of 1926. Gross incomes for the respective quarters were $886,034 and $1,142,420.

Imports and Exports of Ores and Metals in April, 1926 and 1927

Compiled from U. S. Department of Commerce Records

In pounds unless otherwise stated

Imports

	April 1926	April 1927
Antimony		
Ore { Gross weight	611,607	1,257,334
Ore { Antimony content	309,483	777,356
Liquated regulus or metal	2,307,618	3,681,883
Copper		
Ores, copper content	3,601,171	6,582,651
Concentrates, copper content	2,236,136	4,390,546
Regulus, coarse metal, and cement copper	996,524	55,691
Imported from		
Spain	143,360	573,306
Canada	3,261,837	4,555,470
Mexico	2,262,361	2,296,917
Cuba	.....	2,208,000
Chile	102,669	1,055,216
Peru	341,053	43,769
Other countries	722,551	296,210
Unrefined black, blister, and converter copper in pigs, bars, and other forms	47,472,138	32,645,390
Refined copper	14,484,700	14,247,688
Old and clippings for remanufacture	1,883,556	456,589
Composition metal, copper chief value	.....	11,461
Brass		
Old and clippings for remanufacture	492,610	849,644
Lead		
Ore and matte	6,784,895	4,972,942
Bullion or base bullion	15,812,166	21,609,195
Pigs, bars, and scrap	1,126,332	124,988
Babbitt, solder, and other forms, lead content	114,714	176,259
Type metal and antimonial lead { Gross weight	892,586	171,862
Type metal and antimonial lead { Lead content	857,046	116,912
Manganese		
Ore, tons { Cuba, manganese content	.....	158
Ore, tons { Other countries, manganese content	55,583	29,704
Pyrites, tons	6,365	11,557
Tin		
Ore, tons	77	10
Bars, blocks, and pigs	13,243,679	13,950,762
Imported from		
Netherlands	942,534	1,648,817
United Kingdom	4,427,709	2,474,958
British Malaya	7,359,393	8,917,060
China	33,640	.....
Dutch East Indies	58,566	.....
Hongkong	123,423	224,747
Australia	212,800	179,200
Other countries	85,614	505,980
Zinc		
Ore, zinc content { Free	.....	.....
Ore, zinc content { Dutiable	2,243,331	775,400
Blocks, pigs, and old	1,566	6,895

Exports

	April 1926	April 1927
Copper		
Ores, concentrates, composition, and unrefined	999,677	769,899
Refined in ingots, bars and other forms	83,755,058	80,437,799
Exported to		
Belgium	8,816,668	6,148,478
France	18,574,725	9,866,579
Germany	14,558,878	16,588,451
Italy	8,538,344	5,739,474
Netherlands	4,685,469	8,772,318
Spain	728,523	180,433
Sweden	2,221,711	2,293,815
United Kingdom	15,098,064	15,530,958
Other Europe	504,860	11,550,326
Canada	1,098,625	1,771,091
British India	1,176,734	441,682
China, Hong Kong, and Kuantung	2,408,000	123,200
Japan	5,032,574	927,589
Other countries	311,883	503,405
Old and scrap	910,176	4,521,719
Pipes and tubes	258,496	220,091
Plates and sheets	507,222	1,339,940
Rods	2,945,386	6,450,361
Wire	1,307,763	845,814
Insulated copper wire and cable	2,088,044	1,887,425
Lead		
In pigs, bars, and other forms	.....	.....
From domestic ore	3,716,426	524,574
From foreign ore	9,450,832	18,882,326
Exported to:		
Belgium	448,113	.....
France	2,464,595	806,650
Germany	3,786,578	2,912,658
Netherlands	336,098	.....
Sweden	840,373	224,006
United Kingdom	2,408,694	3,024,731
Other Europe	.....	4,738,475
Brazil	448,096	571,287
Other South America	255,618	1,669,578
Japan	1,456,475	4,481,843
Other countries	722,618	977,672
Other lead manufactures	3,215,370	785,448
Zinc		
Ore and concentrates, tons	20,030	4,339
Dross	2,163,468	253,255
Cast in slabs, blocks or pigs	6,315,893	3,157,072
Exported to		
Belgium	336,022	56,000
France	1,064,084	448,093
Germany	832,222	124,450
Italy	224,013	112,060
Netherlands	.....	8,323
United Kingdom	672,295	112,039
Other Europe	336,038	224,041
British India	1,232,217	.....
Japan	1,456,213	784,025
Other countries	162,789	1,288,041
Sheets, strips other forms	697,185	3,898,844
Dust	158,570	195,884
Other zinc manufactures	178,987	321,303

The Market Report

Copper Climbs Close to 12¾c.—Better Prices for Zinc—Lead Easier but More Active

New York, June 1—A distinctly better feeling exists in the non-ferrous metal markets today than prevailed a week ago. Copper, which sagged to 12½c. delivered in the East, has recovered sharply, and on a good volume of business has approached 12¾c. today, one or two sales at 12⅝ making it impossible to quote the even quarter. Zinc, likewise, has advanced from 6c. to 6.10c. during the week, though the market has not been active. Lead is down 10 points from a week ago, but business has picked up, and the tone of the market seems good. Tin was bought in fair quantity on one or two days, and prices are somewhat firmer. Antimony, on the other hand, is easier, and the market is lethargic. Platinum continues exceptionally dull, with prices, largely nominal, somewhat lower than last week. Quicksilver, likewise, has declined, apparently on profit taking by traders who bought several weeks ago on the rise. The European market, however, is strong, and prices at the mines are higher, in part because of the enhanced value of Italian exchange. Silver is quiet, with little change in prices.

Daily Prices of Metals

May / June	Copper	Tin		Lead		Zinc
	Electrolytic, N. Y.	99 Per Cent	Straits	N. Y.	St L	St. L.
26	12 30	63 625	67.00	6.40	6.05	6 00
27	12 375	63.50	67 00	6.375@6.40	6 05	6 05
28	12 40	63.50	67.00	6.40	6.05	6 05
30	Holiday	.....	.....	.....	.....	.....
31	12 40	63 25	67.125	6.40	6 05	6 10
1	12.50	63 25	67 25	6 40	6 05	6.10
	12 395	63.425	67.075	6.398	6 050	6 060

Average prices for calendar week ending May 28, 1927, are: Copper, 12.363c.; 99 per cent tin, 63.833c.; Straits, 67.396c.; N. Y. lead, 6.446c.; St. L. lead, 6.108c.; zinc, 6.035c.; and silver, 56.750c.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis: i.e., delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted, and prices at so-called Middle West destinations, 0.325c. above.

Quotations for copper are for ordinary forms of wire bars, ingot bars, and cakes. For ingots an extra 0.05c. per pound is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

May / June	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
26	53 7/16	54 1/8	59¾	293¾	285½	24⅛	24 7/16	27⅞	28¼
27	54 1/16	54 11/16	59⅞	293	285¼	24	24 5/16	28	28¼
30	54¼	54⅞	60	294	286	24⅜	24 11/16	28½	28 9/16
31	54⅜	55	60	291½	284⅝	24 5/16	24 11/16	28⅜	28⅜
1	54 9/16	55 3/16	60	291¾	285¼	24⅝	25	28⅜	28½

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

May	Sterling Exchange "Checks"	Silver		Gold London	May / June	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
26	4.85⅜	57¼	26 7/16	84s11½d	30	Holiday	...	26 9/16	84s11½d
27	4.85⅜	56⅝	26¼	84s11½d	31	4.85¼	57	26⅜	84s11½d
28	4 85¼	56⅞	26⅜	.....	1	4 85¼	57	26⅜	84s11½d
					Avg.		56.950		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

Average Metal Prices for May, 1927

Copper:	
New York Electrolytic	12.621
London Standard Spot	54.563
London Electrolytic Spot	60.881
Lead:	
New York	6.616
St. Louis	6.269
London Spot	25.054
London Forward	25.526
Silver:	
New York	56.280
London	26.072
Sterling Exchange	485.288
Zinc:	
St. Louis	6.075
London Spot	29.034
London Forward	29.131
Tin:	
99 per cent	63.935
Straits	67.510
London	294.938
Quicksilver	123.900
Antimony	12.975
Platinum:	
Refined	84.680
Crude	75.000
Aluminum, 98 per cent	26.000

Active Week in Copper

The tonnage of copper sold is larger than that of the active week that preceded it. At the same time it does not approach the ideas of many sellers as to what the aggregate would be. In many quarters a repetition was expected of the period in February, when the price sagged to 12.50c., at which record-breaking buying developed, followed by a gradual increase in prices. Only about 10,000 tons changed hands at 12.50c. on the latest movement. This includes sales at the low figure on last Wednesday, Thursday, and Friday. On each day there was sufficient business at 12⅝c. in the East and 12¾c. in the West to keep the quotation above 12½. On Friday most of the 12.50c. metal had disappeared and 12⅝c. represented the bulk of the sales. On Saturday and Tuesday, Monday being a holiday, business continued good at 12⅝c., and today several good orders have been placed at 12¾c., together with some at 12.625c. One or two sellers have advanced their asking price to 12⅞c., but they had little expectation of getting it today.

The exporter's price, 13c. c.i.f.,, apparently has seemed attractive to European buyers, and an excellent business has been done. Estimates place the average daily sales by domestic producers for foreign delivery at about 5,000 tons per day. This is in addition to the quota of the foreign members of the association. In the f.a.s. market 12.80c. has been done, presumably to dealers or speculators to whom the association does not care to sell.

Among the large domestic buyers have been brass companies and manufacturers of electrical equipment. There are some indications that wire business is slacking off. Deliveries specified are principally for June and

July, although August and even September are represented by good sales. Sentiment among producers seems to be better than it has been for some time, but, on the other hand, consumers cannot be said to appear worried.

Lead at 7.40c., New York

Last Thursday lead prices declined a further 10 points, in both the New York and the St. Louis markets, following a 5s. decline in London. On that day, May 26, the American Smelting & Refining Co. reduced its contract price from 6.50 to 6.40c., New York, and sellers in the Middle West came down from 6.15c., St. Louis, to 6.05c. Business on the whole has been somewhat better; Monday's holiday of course cut into the total. but inquiries yesterday were improved. Some lead was sold last Friday as low as 6⅜c., New York, but the seller has refused to book anything under 6.40c. since then. The market seems slightly stronger, doubtless owing to the improvement in London, the reason for which is unknown, as no unusual foreign demand has been apparent on this side. There has been some inquiry for July lead, and occasional sales have been made for that position, but most of the orders continue to be for prompt shipment. Battery and cable makers continue to be only small factors in the market; some improvement in the demand from battery makers is hoped for as a result of the probable demand for Ford's new model, to be put into production in a month or two.

Corroding grades of lead continue at $2@$3 per ton premium over ordinary grades. Both chemical and desilverized grades are in ample supply, and no distinction in price is made between them.

Zinc Bottomed at 6c.

For the time being at least the zinc market has turned upward from the 6c. level reached last Thursday. Galvanizers displayed more interest during the week, and a fair business was done, with a gradual improvement in prices up to 6.10c. Output from the Joplin mines has shown progressive decline to about 10,000 tons of zinc concentrate per week. Although only 6,000 tons was sold last week, it is believed that the reason was the disinclination of sellers to accept $38 and $39 rather than lack of demand on the part of smelters. The opinion seems to be that still further curtailment in mine production will be effected and that the price should remain at least above 6c. Producers are quoting 8c. for prompt shipment of High-grade zinc in the New York territory.

Tin Prices Hold Well

The tin market ruled very quiet until yesterday, when there was a scramble among dealers. and prices for all positions were marked up quite a bit during the day. Consumers were not so much interested. The advance in London today was much less than expected, but the New York market continued strong, and prices were again higher. Tin for delivery three months hence has averaged about 3c. per lb. below the price of prompt Straits, early deliveries continuing exceedingly scarce. The 99 per cent grade is also much below Straits, the differential being between 3 and 4c. Prompt Straits in New York today sold at 67¼c., which is ⅛c. below a week ago, but ¼c. above the low during the week. United States tin deliveries for May amounted to 6,070 tons, compared with 6,720 in April and 5,685 in May, 1926.

Lire Again Up

Mussolini's policies continued to have a buoyant effect on the lira during the last week, the Italian currency going a little above 5¼c. Closing cable quotations on Tuesday, May 31, were as follows: Francs, 3.91¾c.; lire, 5.50c.; and marks, 23.705c. Canadian dollars, $\frac{1}{32}$ per cent premium.

Silver Again Up to 57c.

The London silver market fluctuated within narrow limits, and the New York market followed, with quotations slightly above London parities. India and China both bought and sold, and the market closes quiet and steady.

Mexican Dollars (Old Mexican pesos) —May 26th, 43¼c.; 27th, 43c.; 28th, 43⅛c.; 30th, holiday; 31st and June 1st, 43¼c.

Zinc Blende Price Unchanged—Lead Ore $2 Lower

Joplin, Mo., May 28, 1927

Blende	Per Ton
High	$44.35
Premium blende, basis 60 per cent zinc	$39.00@ 40.00
Prime Western, basis 60 per cent zinc	38.00@ 39.00
Fines and slimes, 60 per cent zinc	37.00@ 35.00
Average settling price, all zinc	37.56
Galena	
High	$86.75
Basis, 80 per cent lead	78.00
Average settling price, all lead	84.89

Shipments for the week: Blende, 9,622; lead, 1,424 tons. Value of shipments for the week: $481,740.

The bulk of the shipments of zinc concentrate this week was from the mines of smelting companies, and was for either their own works or for other smelting companies. Tonnage represented approximately the purchase of last week. The bin stocks of zinc concentrate were about 30,000 tons. Weekly production decreased to 10,000 tons. The increase in bin stocks was less than 1,000 tons this week. Although the $38 base price was stated, and used in a few instances, practically all Prime Western grades of concentrate sold on a basis of $39 per ton.

Platteville, Wis., May 28, 1927

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$40.75
Lead Ore	
Lead, basis 80 per cent lead	$78.00

Shipments for the week: Blende, 1,313 tons; lead, 120 tons. Shipment for the year: Blende, 27,581; lead, 800 tons. Shipments for the week to separating plants, 2,338 tons blende.

Steel Production Continues High

Pittsburgh, May 31, 1927

Steel production decreased but slightly during May, and the month's total seems to have been a trifle above that of last May, just as March showed 1½ per cent heavier production than the preceding March, both being peak months, and last March the record high for any month. The recession has been mild, as was the condition a year ago.

Pig Iron.—The Valley market remains stagnant. Bessemer, $19; basic, $18; foundry, $18.50, f.o.b. Valley furnaces.

Connellsville Coke — A reduction in wages may be forced by furnaces refusing to renew contracts for third quarter, at the $3.50 basis of present contracts. Spot coke remains dull with furnace at $2.85@$3 and foundry at $4@$4.75.

Other Metals

Quotations cover large wholesale lots, f.o.b. New York, unless otherwise specified. London prices are according to latest mail advices.

Aluminum — Per lb., 99 and 98 per cent grades, price of leading interest, 26c.; outside market, 25.30@25.80c. Consumption steady. London, 98 per cent, £104@£106 per long ton for domestic consumption.

Antimony—Per lb., duty paid, spot: Chinese brands, range for week, 13⅜@ 12⅞c.; July arrival, ⅛c. higher. Little interest shown. Cookson's "C" grade, spot, 18c.

Chinese needle, lump, 8c. Standard powdered needle, 200 mesh, 10c. White oxide, Chinese, 99 per cent Sb_2O_3, 16½c. Nominal.

Bismuth—Per lb., in ton lots, $2.20@ $2.25. London, 8s.

Cadmium — Per lb., 60c. London, 1s. 10d. for Australian metal.

Cobalt—F.o.b. Canadian works, per lb., shot, 96@98 per cent, $2.50. Black oxide, 70 per cent, $2.10. London, 8s. 6d.@10s. for metal; 8s. for black oxide; 8s. 10d. for gray.

[1]**Germanium Oxide**—Per gm. in 300- to 500-gm. lots, $5.

Iridium—Per oz., $107@$112 for 98@ 99 per cent sponge and powder. London, £32½ in iridio-platinum; £17@£19, nominal, for sponge and powder.

[1]**Lithium**—Per lb., 95@96 per cent grade in 1- to 5-lb. lots, $65.

Magnesium—Per lb., in ton lots: 8-lb. ingots (3x3x15 in.), 75c.; 3-lb. sticks (1¾x33 in.), 80c.; 10-oz. sticks, (1x12 in.), 90c. Market firm. Good demand reported for light alloys. London, 3s. 9d.@4s. 3d. for 99 per cent ingots or sticks.

[1]**Molybdenum**—Per kg., 99 per cent, $25; chemically pure metal, $80.

Monel Metal—Base price for shot, 32c. per lb.

Nickel—Per lb., ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade), for single lots of spot metal. London, £170@£175 per long ton according to quantity. Demand continues good.

Osmium—Per oz., $55@$60; London, £15@£18.

Palladium—Per oz., $54@$56. Small lots bring up to $60. Pure metal as a constituent of crude platinum, nominal. London, £11@£12. Nominal.

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[1]Price furnished by Foote Mineral Co., Philadelphia.

Platinum—Official price quoted by the leading interest on small miscellaneous orders for refined metal, per oz., $80. Open market cash sales of large lots at $65@$67. Pure metal as a constituent of crude platinum, $75, nominal average price for month of May. Market still very quiet.

London, £15 per oz. for refined; crude and scrap, nominal.

Quicksilver—Per 75-lb. flask, $123. San Francisco wires $123. London, firm at £22 15s.@£23.

Radium—Per mg. radium content, $70.

Rhodium — Per oz., $55; London, £9½@£13. Nominal.

Ruthenium—Per oz., $40. Nominal. London, £7½@£10.

Selenium — Black, powdered, amorphous, 99.5 per cent pure, $1.90@$2 per lb. in ton lots. London, 7s. 6d.@7s. 8d.

Tantalum—Bar and heavy sheet, chemically pure, $200 per kg.

Tellurium—Per lb., $2.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $15 per lb. in 25-lb. lots.

Tungsten Powder—Per lb., 97 to 98 per cent pure, $1.05.

[1]**Zirconium Metal**—Per lb., 98 per cent grade, $15 in 5- to 10-lb. lots.

Metallic Ores

Chrome Ore—Per long ton, f.o.b. Eastern shipping points, $22@$24 for 45 to 50 per cent Cr_2O_3 ore. Prices firm.

Iron Ore—Lake Superior ores, per long ton, lower Lake ports; prices have been reaffirmed for the coming season.

Mesabi, non-bessemer, 51½ per cent iron, $4.25. Old Range, $4.40.

Mesabi, bessemer, 51½ per cent iron, $4.40. Old Range bessemer, 51½ per cent, $4.55.

Eastern ores, cents per unit, delivered at furnaces: Foundry and basic, 53 to 63 per cent, 9@10½c.

Foreign ores, f.o.b. cars Atlantic ports, cents per unit:

Swedish and Norwegian, low-phosphorus, 68 per cent, 10½@10¾c.

Spanish low-phosphorus, 52@54 per cent, nominal.

North African, low-phosphorus, 10½@11½c.

Spanish foundry or basic, 50@54 per cents, nominal.

Swedish foundry or basic, 66@68 per cent, 9½c.

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports, minimum 47 per cent Mn, 36@38c. Caucasian (washed), 53@55 per cent, 38@40c.

[1]Chemical grades, powdered, coarse or fine, 82@87 per cent MnO_2, Brazilian and Cuban, $70@$80 per ton in carloads.

Molybdenum Ore—Per lb. of MoS_2, for 85 per cent MoS_2 concentrates f.o.b. Denver, Colorado, 50c.

Tantalum Ore—Per unit of Ta_2O_5, basis 65 per cent ore, $12@$15.

Titanium Ore—Ilmenite, 52 to 60 per cent TiO_2, f.o.b. Atlantic seaboard, $10@$18 per gross ton, according to grade and impurities. Low-grade domestic, 32 to 35 per cent, about $7@$8 per gross ton. Rutile, 96 per cent concentrate, 11c. to 13c. per lb.

Tungsten Ore—Per unit of WO_3, N.Y.: Wolframite, $10.50@$10.75; Western scheelite, $11@$11.25.

Uranium Ore—Minimum 5 per cent U_3O_8, per lb. of U_3O_8 contained, nominal at $5, f.o.b. Montrose, Colo.

Vanadium Ore — Containing 5 per cent V_2O_5, nominal at 25c. per lb. of V_2O_5, f.o.b. Montrose, Colo.

Foreign concentrate (lead vanadate) 12 to 18 per cent V_2O_5, 55@60c. per lb. V_2O_5, duty paid, seaboard. Nominal.

Non-Metallic Minerals

Prices received for non-metallic minerals vary widely and depend upon the physical and chemical characteristics of the commodity. Hence the following quotations can serve only as a general guide to the prices obtained by producers and dealers in different parts of the United States for their own product. In the last analysis the value of a particular non-metallic mineral can be ascertained only by direct negotiation between buyer and seller.

[1]**Amblygonite**—8@9 per cent lithium oxide, $50@$60 per ton, f.o.b. mines.

Asbestos—F.o.b. *Quebec* mines, tax and bags included, prices quoted by leading interests, per ton:

Crude No. 1, $525; crude No. 2, $325; spinning fibers, $200; magnesia and compressed sheet fibers, $125@$165; shingle stock, $70@$80; paper stock, $40@$45; cement stock, $25; short fibers, $10@$17.50; floats, $15. Market does not readily absorb current production of grades lower than shingle. Consequently there is a tendency toward curtailment, with stiffer prices for higher grades.

No. 1 Rhodesian crude, $425; No. 2, $325@$350 per ton, c.i.f. New York.

Barytes—F.o.b. mines, bags extra:

Georgia: Barytes ore, crude, per long ton, $7@$7.50. Wet ground, off-color, $12@$18, depending on analysis. Good demand.

Missouri: Water ground and floated, bleached, $23; $25 in less than car lots, f.o.b. works. Crude ore, 93 per cent $BaSO_4$, not to exceed 1 per cent iron, per ton, $8, f.o.b. mines. Market fair; production limited.

Bauxite—No. 1 chemical ore, over 60 per cent Al_2O_3, less than 5 per cent SiO_2, and less than 2 per cent Fe_2O_3, $8 per long ton, f.o.b. *Georgia* mines.

Foreign, per metric ton, c.i.f.: Dalmatian, low SiO_2, $5@$6.50; Istrian, $5.50@$7; French, red, $6@$7.50.

Borax—Carload lots, in bags, per lb.: crystals, 4¼c.; granulated or powdered, 4c.; f.o.b. plant, *Pennsylvania.*

[1]**Celestite**—90 per cent $SrSO_4$, finely powdered, $27 per ton in carload lots.

Chalk—Crude, in bulk, per ton c.i.f. *New York,* $4.75@$5.

China Clay (Kaolin)—F.o.b. *Virginia* mines, per ton; crude, lump, No. 1, $7; crude No. 2, $5.50; washed, $8; powdered and air-floated, $10@$15; ground, $7@$10.

Florida, pressed pottery, bulk, $13; ground, No. 1, $20; No. 2, $15. Sprayed mineral flour No. 1, $20; No. 2, $17.

[1]Price furnished by Foote Mineral Co., Philadelphia.

1A grades, domestic, $16@$17, f.o.b. *Delaware* plants in carload lots. Fair demand.

Imported English, f.o.b. American ports: Lump, $13@$21; powdered, $45@$50.

Diatomite—Per short ton, f.o.b. plant:

Kiln-fired brick, $65; kiln-fired aggregate, ¼ in., $45; insulating powder, $30; natural aggregate, ¼ in., $20; air-floated powder, $40. Over 85 per cent silica, 98 per cent through 200 mesh, $15@$16, depending on quantity.

Emery — F.o.b. *Pennsylvania* and *New York* in 350-lb. kegs, per lb.: Greek Naxos, 6½c.; Turkish, 6½c.; Khasia, 5½c.; domestic, 3½@4c. Market good.

Feldspar—F.o.b. mine or grinding plant:

North Carolina: No. 1 pottery grade, $5.75@$7 per long ton. Market good for best grades; dull for others.

New Hampshire: Pottery grade, $8.25 per ton; soap grade, $8.75.

New York: Per ton, f.o.b. cars, No. 1 crude, $9. Market fair.

Tennessee: No. 1, pottery, 140 mesh, $16 per ton; 200 mesh, $18. No. 2, enamel, 140 mesh, $14; 200 mesh, $16.

Maine: Pottery grade, ground, $19 per ton. Market good.

Fluorspar—F.o.b. *Kentucky* and *Illinois* mines, per short ton:

Gravel, not less than 85 per cent CaF_2, and not over 5 per cent SiO_2, $18. Foundry lump, 85-5, $20. Ground, 95 to 98 per cent CaF_2, and not over 2½ per cent SiO_2, $32.50 in bulk; $36.50 in bags or barrels. Acid lump, 98-1, $30 in car lots. Market inactive.

New Mexico: 85-5 gravel, $16.50; 85-5 lump, $16.50; 93-3 lump, $19; 96-3, ground 100 mesh, $35, bulk; $40 bags. Market good.

Foreign spar, duty paid, $16.50@$17, tidewater. Prices easier.

Fuller's Earth — Per ton, f.o.b. *Florida:* 16 to 30 mesh, $16.50; 30 to 60 mesh, $18; 60 to 100 mesh, $15; 100 mesh up, $8; 200 mesh up, $15. Market fair at unchanged prices.

Powdered, import duty paid, $24@$25 per ton.

Garnet — Domestic, per ton, f.o.b. mines, $85. Market easy.

Spanish grades, $60, c.i.f. port of entry.

Gilsonite—Per ton, carload lots, f.o.b. mines *Colorado:*

Selected grade, $33; seconds (mine run), $22.50.

Graphite—F.o.b. *New York,* per lb.:

Ceylon lump, 7½@8c.; chip, 6½@7c.; dust, 2¾@$5; Madagascar flake, 7@7½c. Market quiet. Prices for Ceylon easier; for Madagascar, firmer.

No. 1 flake, 10c. up; fine flake, 8c. up. Foundry facings, 4c. up. Amorphous, fine ground, 3c. up; fine ground crystalline, 5c. up. Crude amorphous graphite, $15@$35 per ton, according to grade. Strong competition and price cutting.

Greensand—Per ton, f.o.b. cars, *New Jersey:* Screened and bagged, best grade in carload lots, $25. Demand good.

Gypsum—Per ton f.o.b. mill, depending upon location: Crushed, $2.75@$3; ground, $4@$10; agricultural, $6@$15; calcined, $8@$10.

Iron Oxide (See Ocher) — Standard Spanish red, 2¾@4c. per lb.; domestic earth, 2@4½c.

Kaolin—See China Clay.

[1]**Lepidolite** — $20@$30 per ton for ordinary grades. Nominal.

Limestone — F.o.b. shipping points, depending on location, either lump or crushed, 75c.@$2 per ton.

Agricultural, 75c. up to $4 or $5 for crushed or pulverized. Prices depend upon source, purity, and fineness.

Magnesite — Per short ton, f.o.b. *California* mines: Grade "A" calcined, 80 per cent through 200 mesh, $40; grade B, $38; dead burned, $33; crude, $14. F.o.b. Eastern seaboard, calcined, $40. Market fair.

Mica—F.o.b. plant, per ton:

New Hampshire: Mine run, $360; clean shop scrap, $25; mine scrap, $20. White dry ground, 20 mesh, $28; 40 mesh, $35; 60 mesh, $55; 100 mesh, $70; 200 mesh, $85. Good demand, particularly for finer meshes of ground material.

North Carolina: White, ground, 20 mesh, $35; 70 mesh, $100.

Madagascar, amber, dark, free from iron, per lb., f.o.b. *New York*, duty paid: No. A1, $3.50@$3.75; No. 1, $3.25; No. 2, $3.10@$3.15; No. 3, $1.60; No. 4, 95c.; No. 5, 48@54c. Strong market on account of cyclone destroying port of shipment (Tamatave) in Madagascar. No arrivals expected for several months.

[1]**Monazite**—Minimum 6 per cent ThO_2, $120 per ton.

Ocher — F.o.b. *Georgia* mines, per ton: $22.50@$25 in sacks; $25@$30 in barrels; washed and water floated, $22 @$25; second grade, 99 per cent through 225 mesh, $18. Market fair.

Phosphate—Per long ton, f.a.s. or f.o.b. mines:

Florida, pebble, f.a.s., for export: 76@77 per cent, $7; 75 per cent, $6.25; 74@75 per cent, $6; 70 per cent, $4.50; 68 per cent, $4.10; 66 per cent, $4. Prices firm; Market active..

Florida, pebble domestic: 76@77 per cent, $6; 75 per cent, $5.25; 74@75 per cent, $5; 72 per cent, $4; 70 per cent, $3.50. Market dull and prices easy, on account of small buying by fertilizer manufacturers.

Tennessee, ground, 95 per cent through 100 mesh, basis 65 per cent B.P.L. (tricalcium phosphate), $8 per short ton, with unit differential of 20c. per ton. Market slow. Brown lump for acid manufacturers, per gross ton, $5.50 on 75 per cent basis; $4.50 for 72 per cent basis.

Potash — The ruling contract prices are as follows:

	Bags	Bulk
Muriate of potash 80 @ 85 per cent, basis 80 per cent....	36.40	34.80
Sulphate of potash 90 @ 95 per cent, basis 90 per cent....	47.30	45.70
Sulphate of potash-magnesia 48 @ 53 per cent, basis 48 per cent	27.25	25.65
Manure salt 30 per cent.....	21.75	18.75
Manure salt 20 per cent.....	15.40	12.40
Kainit 14 @ 16 per cent....	12.50	9.50
Kainit 12.4 per cent.....	12.00	9.00

Two thousand pounds net weight, c.i.f. Atlantic and Gulf ports. German weights, tares and analyses. Although the guarantee against price declines of both the German and French syndicates expired April 30, producers' representatives have not announced whether there will be any immediate change in quotations.

Discounts: 5 per cent on minimum of 50 tons K_2O; 6 per cent on 100 tons; 7 per cent on 300 tons; 10 per cent on 500 tons.

Pumice Stone — In barrels, per lb., powdered, 2½@4c.; selected lump, 5@7c.

Pyrites—Tharsis, per long-ton unit of sulphur, c.i.f. U. S. ports; guaranteed 48 per cent sulphur, furnace size, 2½-in. diameter, 13¾c. Same price for fines screened through ½-in. mesh. Cinder from ore to remain property of buyers. Market fair.

[1]**Quartz Rock Crystals** — Colorless, clear and flawed, pieces ¼ to ½ lb. in weight, 40c. per lb. in ton lots. For optical purposes, double above prices.

Silica—Water ground and floated, per ton in bags f.o.b. Illinois: 400 mesh, $31; 350 mesh, $26; 250 mesh, $18. Market fair. Glass sand, f.o.b. producing plant, 75c.@$5 per ton; molding sand, 65c.@$3.50; blast sand, $1.35 @$3.50.

[1]**Spodumene**—$20@$30 per ton, depending upon lithium content. Nominal.

Sulphur—$18 per ton for domestic market, f.o.b. Texas mines; $22 for export, Atlantic ports. Prices in reality are on a c.i.f. basis, but the average price reduced to an f.a.s. figure is about as given. Good shipment against contracts. Open prices $1 higher than above.

Talc — Per ton, carload lots, f.o.b. works, containers included:

Vermont: 99 per cent through 200 mesh, extra white, $10.50; 96 per cent through 200 mesh, medium white, $9.50; packed in 50-lb. paper bags. Demand firmer but uneven. Competition active.

New York: Double air-floated, 200 mesh, $13.75; 325 mesh, $13.75. Demand good.

Georgia: Powdered, gray, $7.50@$10; yellow, $9@$12; red, $11@$13; roofing, $7.50@$9. Market fair.

New Jersey: Soapstone, ground, 10 @$12; market good.

Tripoli—Per short ton, burlap bags, paper liners, minimum carload 30 tons, f.o.b. *Missouri:* Once ground through 40 mesh: rose and cream colored, $14. Double ground through 110 mesh: rose and cream, $17. Air-floated through 200 mesh, rose and cream, $25; mill run, $15. Business fair.

[1]**Zircon**—95 per cent, 3c. per lb., f.o.b. mines, in carload lots.

Mineral Products

Arsenious Oxide (white arsenic)—3¾c. per lb. London, £16 per long ton for Cornish white.

Calcium Molybdate—$1.20 per lb. of contained Mo, delivered.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Copper Sulphate (blue vitriol)—4.90c. @5c. per lb., depending on quantity, for either large or small crystals.

Sodium Nitrate—Crude, per 100 lb., ex vessel, Atlantic ports, $2.60 for spot; future delivery, $2.20.

Sodium Sulphate (Salt Cake)—Per ton, bulk, f.o.b. works, $18@$20.

Zinc Oxide—Per lb. in bags, in car lots: Lead-free, 6⅝c.; 10, 20 or 35 per cent leaded grades, 6⅝c.; French red seal, in bags, 9⅜c.

Ferro-Alloys

[1]**Ferrocerium**—Per lb., $5.50.

Ferrochrome—Per lb. of contained chromium, 60@70 per cent chromium, 4 to 8 per cent carbon, 11½c. Market good.

Ferromanganese—Domestic and foreign, 78@82 per cent, $90 per gross ton furnace, for delivery during first half of 1927. Spiegeleisen, 19@21 per cent, $36@$37 on carload business, f.o.b. furnace; 16@19 per cent, $34. Regular consumers covering for second half.

Ferromolybdenum — Per lb. of Mo, f.o.b. shipping point, 50@60 per cent Mo, $1.25 on contract; $1.30 for spot. Business good; mostly on contract.

Ferrophosphorus — Per ton, 18 per cent P, $91; electrolytic, 24 per cent, $122.50; f.o.b. *Alabama* and *Tennessee*.

Ferrosilicon—Per gross ton, f.o.b. works, freight allowed on carload lots east of Mississippi River: 50 per cent, $85; 75 per cent, $145; 14@16 per cent, $45. Active market.

Ferrotitanium—For 15 to 18 per cent material, $200 per ton, f.o.b. Niagara Falls, N. Y.

Ferrotungsten—Per lb. of W contained, 75@80 per cent W, 98c.@$1, f.o.b. works. Quiet.

[1]**Ferro-uranium**—30 to 40 per cent U, $4.50 per lb. of U contained, f.o.b. works in 500-lb. lots.

Ferrovanadium—Per lb. of V contained, f.o.b. works, $3.15@$3.65, depending on grade. Market active.

Metal Products

Rolled Copper—Sheets, 21½c.; wire, 14⅝@14¾c. per lb., f.o.b. mill.

Lead Sheets — Full rolled, 10c. per lb.; clipped, 10¼c.

Nickel Silver—28⅜c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal — Dimension sheets, 18¾c. per lb.; rods, 15¾c. per lb.

Zinc Sheets—9¾c. per lb., f.o.b. works.

Refractories

Chrome Brick—$45 per net ton, f.o.b. shipping point.

Fireclay Brick—First quality, $40@ $43 per M., *Ohio, Kentucky, Central Pennsylvania;* second quality, $35.

Magnesite Brick—9-in. straights, $65 per net ton, f.o.b. works.

Silica Brick—$43 per M., *Pennsylvania* and *Ohio;* $50 *Alabama* and *Illinois*.

[1]**Zirkite**—Powdered, 80 per cent ZrO_2, 3c. per lb. Brick, straights, 80c.@$1 each.

Metal Statistics

Monthly Average Prices of Metals

Silver

	New York		London Spot		Sterling Exchange	
	1926	1927	1926	1927	1926	1927
January	67.795	55.795	31.322	25.863	485.295	484.775
February	66.773	57.898	30.797	26.854	485.852	484.551
March	65.880	55.306	30.299	25.655	485.606	484.887
April	64.409	56.399	29.682	26.136	485.702	485.178
May	65.075	56.280	30.125	26.072	485.485	485.288
June	65.481	.....	30.248	.....	486.000	.....
July	64.793	.....	29.861	.....	485.755	.....
August	62.380	.....	28.773	.....	485.293	.....
September	60.580	.....	27.904	.....	484.845	.....
October	54.505	.....	25.291	.....	484.475	.....
November	54.141	.....	25.192	.....	484.359	.....
December	53.466	.....	24.733	.....	484.553	.....
Year	62.107	.....	28.686	.....	485.268	.....

New York quotations, cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London Spot			
	Electrolytic		Standard		Electrolytic	
	1926	1927	1926	1927	1926	1927
January	13.822	12.990	59.013	55.414	65.325	62.375
February	13.999	12.682	59.669	54.438	66.375	61.119
March	13.859	13.079	58.603	55.935	65.489	62.641
April	13.706	12.808	57.200	55.056	64.600	61.526
May	13.599	12.621	56.494	54.563	64.313	60.881
June	13.656	.....	56.778	.....	64.591	.....
July	13.924	.....	57.864	.....	65.625	.....
August	14.174	.....	58.857	.....	66.857	.....
September	14.062	.....	58.705	.....	66.528	.....
October	13.862	.....	58.304	.....	66.298	.....
November	13.576	.....	57.293	.....	65.551	.....
December	13.302	.....	56.869	.....	64.114	.....
Year	13.795	.....	57.971	.....	65.472	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London			
	1926	1927	1926	1927	1926 Spot	1926 3 Mos.	1927 Spot	1927 3 Mos.
January	9.255	7.577	9.102	7.392	34.778	34.584	27.485	27.786
February	9.154	7.420	8.991	7.286	33.903	33.903	27.344	27.781
March	8.386	7.577	8.165	7.328	31.625	31.921	27.845	28.302
April	7.971	7.126	7.764	6.807	28.775	29.284	26.546	27.053
May	7.751	6.616	7.538	6.269	28.253	28.719	25.054	25.526
June	8.033	.....	7.876	.....	29.986	30.142	.....	.....
July	8.499	.....	8.383	.....	31.716	31.545	.....	.....
August	8.908	.....	8.722	.....	32.756	32.345	.....	.....
September	8.786	.....	8.515	.....	32.085	31.790	.....	.....
October	8.402	.....	8.130	.....	30.821	30.696	.....	.....
November	8.005	.....	7.800	.....	29.270	29.563	.....	.....
December	7.855	.....	7.688	.....	28.932	29.264	.....	.....
Year	8.417	.....	8.223	.....	31.075	31.146	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Tin

	New York				London	
	1926	1927	1926	1927	1926	1927
	99%		Straits		Spot	
January	61.415	64.785	62.275	66.415	282.038	297.804
February	62.653	66.528	63.705	69.142	287.107	306.125
March	63.472	67.833	64.505	69.199	292.288	313.315
April	61.962	66.069	63.389	67.933	281.388	302.572
May	60.165	63.935	62.305	67.510	270.125	294.938
June	58.409	.....	60.611	.....	268.352	.....
July	61.365	.....	63.091	.....	282.102	.....
August	63.875	.....	65.260	.....	293.690	.....
September	66.535	.....	68.895	.....	306.273	.....
October	68.225	.....	70.245	.....	312.548	.....
November	68.667	.....	70.630	.....	309.284	.....
December	66.635	.....	68.514	.....	306.994	.....
Year	63.615	.....	65.285	.....	291.016	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Zinc

	St. Louis		London			
	1926	1927	1926 Spot	1926 3 Mos.	1927 Spot	1927 3 Mos.
January	8.304	6.661	38.059	37.363	30.979	30.938
February	7.759	6.673	36.053	35.956	29.931	30.109
March	7.332	6.692	34.090	34.247	30.649	30.889
April	7.001	6.338	32.503	32.863	29.579	29.901
May	6.821	6.075	32.038	32.413	29.034	29.131
June	7.112	.....	33.244	33.398	.....	.....
July	7.411	.....	34.045	34.270	.....	.....
August	7.376	.....	34.173	34.524	.....	.....
September	7.413	.....	34.389	34.415	.....	.....
October	7.296	.....	34.256	34.146	.....	.....
November	7.199	.....	33.491	33.483	.....	.....
December	7.018	.....	32.915	32.895	.....	.....
Year	7.337	.....	34.105	34.164	.....	.....

St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Antimony, Quicksilver and Platinum

	Antimony (a) New York		Quicksilver (b) New York		Platinum (c) Refined New York		Platinum (c) Crude New York	
	1926	1927	1926	1927	1926	1927	1926	1927
Jan.	23.490	13.910	87.960	101.200	118.200	109.520	113.200	99.820
Feb.	21.676	14.509	87.580	101.727	113.909	107.545	108.341	99.295
March	19.708	12.801	88.194	110.259	112.000	108.000	106.278	100.426
April	17.462	14.166	89.769	123.250	111.538	101.885	103.731	91.865
May	12.170	12.975	91.365	123.900	108.960	84.680	102.900	75.000
June	11.106	.....	91.346	.....	111.000	.....	106.615	.....
July	14.490	.....	90.163	.....	114.692	.....	109.000	.....
Aug.	15.957	.....	89.260	.....	116.000	.....	108.692	.....
Sept.	15.325	.....	91.425	.....	116.840	.....	108.600	.....
Oct.	13.943	.....	97.260	.....	112.240	.....	106.000	.....
Nov.	13.385	.....	99.000	.....	112.000	.....	105.250	.....
Dec.	13.142	.....	99.510	.....	111.846	.....	105.385	.....
Year	15.988	.....	91.903	.....	113.269	.....	106.999	.....

(a) Antimony quotations in cents per pound, for ordinary brands. (b) Quick silver in dollars per flask of 75 lb. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1926	1927	1926	1927	1926	1927
January	22.76	21.04	21.76	20.01	22.26	20.26
February	22.76	20.76	21.76	19.76	22.26	20.26
March	22.76	21.15	21.76	20.33	22.26	20.26
April	21.38	21.26	20.66	20.49	21.05	20.26
May	21.12	20.94	19.76	19.96	20.76	20.26
June	20.76	.....	19.76	.....	19.80	.....
July	20.44	.....	19.26	.....	19.49	.....
August	19.87	.....	19.18	.....	19.26	.....
September	20.11	.....	19.26	.....	19.30	.....
October	20.76	.....	19.76	.....	19.97	.....
November	21.90	.....	20.46	.....	20.96	.....
December	21.26	.....	20.26	.....	20.53	.....
Year	21.31	.....	20.29	.....	20.64	.....

In dollars per long ton.

Monthly Crude Copper Output in Short Tons

Domestic

	1926		1927			
	Nov.	Dec.	Jan.	Feb.	March	April
Alaska shipments	3,769	2,372	2,981	2,696	3,163	2,121
Braden	10,200	9,235	8,756	8,022	7,293	.....
Chile	9,350	9,352	9,352	9,352	.....	.....
Butte & Superior	.....	†613	.....	.....	†416	.....
Calumet & Arizona	1,833	1,951	1,864	1,500	2,704	1,711
Magma	1,155	1,148	1,264	1,120	1,308	1,232
Miami	2,412	2,268	2,313	2,160	2,342	2,295
New Cornelia	4,227	3,347	2,770	2,373	3,447	2,630
Nevada Con	.....	†31,316	.....	.....	†28,970	.....
Old Dominion	1,127	1,120	1,170	1,162	986	879
Phelps Dodge	6,638	5,732	6,097	6,427	††7,789	8,063
United Verde Extension	1,677	1,586	1,703	1,152	1,322	1,630
Utah Copper	.....	†32,557	.....	.....	†30,876	.....
Tennessee Copper	524	486	486	408	458	410

Foreign

Boleo, Mexico	992	.....	863	885	973	550
Furukawa, Japan	1,668	1,502	1,456	1,249	1,638	.....
Granby Cons., Canada	1,626	*2,355	2,439	1,975	2,339	2,123
Union Miniere, Africa	7,260	7,150	6,505	6,273	6,976	6,039
Mount Lyell, Aust	.....	†1,870	.....	.....	† 1,347	.....
Sumitomo, Japan	1,637	.....	1,408	1,347	1,436	.....
Bwana M'Kubwa	344	376	400	358	450	360

*Starting with December Allenby production is included. †Three months.
††Starting with March Moctezuma is included.

Monthly Production of Primary Copper from U. S. Mines and Daily Rate (Short Tons)

	1925		1926		1927	
	Monthly Production	Daily Rate	Monthly Production	Daily Rate	Monthly Production	Daily Rate
January	74,789	2,412	71,026	2,291	76,198	2,458
February	68,967	2,463	68,131	2,433	69,202	2,472
March	74,901	2,416	75,728	2,443	69,314	2,236
April	70,667	2,356	73,454	2,448	70,552	2,352
May	70,574	2,276	73,542	2,372	.....	.....
June	59,894	2,330	71,317	2,377	.....	.....
July	68,507	2,210	72,278	,330	.....	.....
August	68,090	2,196	72,014	2,323	.....	.....
September	67,720	2,272	72,672	2,421	.....	.....
October	71,042	2,292	75,099	2,423	.....	.....
November	67,400	2,247	74,947	2,498	.....	.....
December	69,566	2,244	72,205	2,329	.....	.....
Total	842,117	.....	872,509	.....	285,266	.....
Monthly average	70,176	.....	72,709	.....	71,317	.....
Average of daily rate	.....	2,307	.....	2,390	.....	2,377

Mining Stocks—Week Ended May 28, 1927

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	47	45¼	45⅝	Ap.16,May21 Q	0.75
Arcadian Consol.	Boston	*35	*30	*32		
Ariz. Com'l	Boston	6	5¼	5⅞	Ja. 7, Ja. 28	0.50
Calaveras	N. Y. Curb	2⅛	2	2⅛		
Calumet & Arizona	New York	69⅛	68	68	Ju. 13, Ju. 20 Q	1.50
Calumet & Hecla	Boston	15⅞	15½	15⅝	My.31, Jn.15 Q	0.50
Cerro de Pasco	New York	61⅛	60	60	Ap. 14, My. 2 Q	1.00
Chile Copper	New York	36⅛	35⅛	35⅜	Jn.3, Jn.30, Q	0.62½
Con. Coppermines	N. Y. Curb	3¼	2⅞	2⅞		
Copper Range	Boston	12⅛	12	12⅛	Ap.2, My.2, A	1.00
Crystal Copper	Boston Curb	*32	*29	*31		
East Butte	Boston	1⅜	1⅛	1⅛	Dec., 1919	0.50
Granby Consol.	New York	45	38½	41⅛	Jn.15 Jy. 1 Q	1.00
Greene-Cananea	New York	48⅛	45⅜	45⅜	Nov., 1920	0.50
Hancock	Boston	*26	*25	*25		
Howe Sound	New York	39	37	37	Apr.1,Apr.15 Q	1.00
Inspiration Consol.	New York	18	15	15⅛	Ma.17, Ap.4, Q	0.25
Iron Cap	Boston Curb			2		
Isle Royale	Boston	10⅛	9⅜	10	Fe.4, Fe.19, Q	0.50
Kennecott	New York	65⅛	64⅜	64⅜	Ju. 3, Jy. 1 Q	1.25
Magma Copper	New York	34⅜	33⅛	33⅛	Ma.31,Ap.15, Q	0.75
Mason Valley	N. Y. Curb			1⅛		
Miami Copper	New York	15⅛	15	15⅛	My.2,My.16 Q	0.37½
Mohawk	Boston	38⅝	38	38⅜	Ap.30, Jn.1 Q	1.00
Mother Lode Coal	New York	3⅜	3	3⅛	De.10, De.31SA	0.37½
Nevada Consol.	New York	14¾	14⅛	14⅜	Ma.17,Ma.31 Q	0.37½
New Cornelia	Boston	22	21⅛	22	My.6, My.23 Q	0.50
Noranda	N. Y. Curb			22⅛		
North Butte	Boston	1⅛	1	1	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*65	*59	*64	Sept. 1926	0.03
Old Dominion	Boston	11⅛	11	11	Dec., 1918	1.00
Phelps Dodge	N. Y. Curb			115	Ma.22, Apr.2 Q	1.50
Quincy	Boston	15	14⅛	15	March, 1920	1.00
Ray Consolidated	New York	15⅛	15	15⅛	Ap.20, Ap. 30	0.25
St. Mary's Min. Ld.	Boston	21⅛	21⅛	21⅛	Fe.10, Ma.10	2.00
Seneca Copper	New York	2⅜	2⅜	2⅜		
Shattuck-Denn	Boston Curb	4⅛	4⅛	4⅛		
Tenn. C. & C.	New York	9	8⅞	8⅞	My.31,Ju.15, Q	0.12½
United Verde Ex	N. Y. Curb	24	23⅛	23⅜	Apr.6, May1 Q	0.75
Utah Copper	New York	115	115	115	Ma.17,Ma.31 Q	1.50
Utah Metal & T	Boston	1 1/16	1	1	Dec., 1917	0.30
Walker Mining	Salt Lake	*60	*58	*59		
NICKEL-COPPER						
Internat. Nickel	New York	71⅛	63⅛	71⅛	Ma.17, Ma.31Q	0.50
Internat. Nickel pfd.	New York			40⅜	Ap.14,My.2 Q	1.50
LEAD						
Gladstone Mtn	Spokane	*25⅜	*24	*24	April, 1927	0.005
National Lead	New York	198	196⅛	196⅛	Jn. 10,Jn.30 Q	1.25
National Lead pfd.	New York	132⅛	131	132⅛	My.10,Jn.15 Q	1.75
St. Joseph Lead	New York	38⅛	36	38⅛	Se.10,Se.20, QX	0.75
ZINC						
Am. Z. L. & S.	New York	8⅛	8	8⅛	May, 1917	1.00
Am. Z. L. & S. pfd.	New York	48	46⅜	47	Nov., 1920	1.50
Butte C. & Z.	New York	5	4⅜	4⅜	De. 9, De. 24	0.50
Butte & Superior	New York	9⅛	9	9	Ma.15,Ma.31 Q	0.50
Callahan Zn-Ld	New York	1⅜	1⅛	1⅛	Dec., 1920	0.50
Consol.Lead&Zinc'A'	St. Louis	13⅛	13¼	13¼	Ma.15, Ap.1 Q	0.25
Eagle-Picher	Cincinnati	26¼	26	26⅛	Au.15,Se.1 Q	0.40
Eagle-Picher pfd.	Cincinnati			116	Jn.30, Jy.15 Q	1.50
New Jersey Zn	N. Y. Curb	186	183	183⅜	Jn.20, Jy.9 QX	2.00
United Zinc	N. Y. Curb			55		
Yellow Pine	Los Angeles	*24½	*17	*17	Dec. 1925 Q	0.04
GOLD						
Alaska Juneau	New York	1⅞	1⅛	1⅞		
Argonaut	Toronto	*55	*47	*49		
Barry-Hollinger	Toronto	*31⅛	*28	*29		
Carson Hill	Boston	*50	*50	*50		
Consol W. Dome L.	Toronto	*6⅛	*6	*6		
Cresson Consol. G.	N. Y. Curb	2 1/16	1 1/16	2	Ma.31,Ap.10 Q	0.10
Dome Mines	New York	7⅜	7¼	7¼	Ap.18, My5, Q	0.25
Golden Cycle	Colo.Springs	†1.66	†1.65		My.31,Ju.10 Q	0.04
Hollinger Consol.	Toronto	20.30	19.90	20.00	Ju. 1, Ju. 7	0.10
Homestake Mining	New York	60	60	60	My.20,My.25 M	0.50
Kirkland Lake	Toronto	1.37	1.28	1.28		
Lake Shore	Toronto	20.30	20.00	20.25	Jn.1, Jn.15 X	0.20
McIntyre-Porcupine	New York	25	24¾	25	My.2, Jn.1 Q	0.25
Portland	Colo.Springs	†*46	†*44		Ap.6, Ap.15, Q	0.02
Rand Mines	New York			9½	Au.23-30 Am.Sh.	1.52
Teck-Hughes	Toronto	7.80	7.65	7.65	Ja.31, Fe.1	0.05
Tom Reed	Los Angeles	*43	*42½	*43	Dec., 1926	0.02
Tough-Oakes	Toronto	*50	*44½	*45		
United Eastern	N. Y. Curb			*35	July, 1924	0.05
Vipond Cons	Toronto	1.10	.90	.90	Apr.1, Apr.15	0.03
Wright-Hargreaves	Toronto	6.05	5.65	6.00	Ap.15,My.2	0.10
GOLD AND SILVER						
Carnegie Metals	Pittsburgh			12⅜		
Con. Cortez	N. Y. Curb	*20	*19	*19		
Con. Virginia	San Francisco	*4½	*3½	*3½		
Dolores Esperanza	N. Y. Curb	*66	*60	*63	July, 1923	0.05
Premier Gold	N. Y. Curb	2 1/16	2	2	Ma.15, Ap. 4 Q	0.08
Tonopah Belmont	N. Y. Curb	1⅝	1 1/16	1 1/16	Ma.15, Ap.4	0.08
Tonopah Extension	N. Y. Curb			*26	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb	2⅜	2¼	2⅜	Ma.31, Apr.21	0.07½
West End Consol.	N. Y. Curb	*11	*9	*11	Mar., 1923	0.05
Yukon Gold	N. Y. Curb			*45	June, 1918	0.02
SILVER						
Beaver Consol.	Toronto	1.13	1.05	1.05	May, 1920	0.03
Canadian Lorrain	Toronto	*22	*22	*22		
Castle-Trethewey	Toronto	*82½	*80	*81		
Coniagas	Toronto	3.55	3.50	3.50	May, 1924	0.12½
Keeley	Toronto	1.29	1.25	1.25	Fe.28, Ma.15 X	0.12
Lorrain Trout Lake	Toronto	*70	*64	*70	July, 1925	0.05
McKinley-Dar.-Sav.	Toronto	*17	*16	*16	Oct., 1920	0.03
Mining Corp. Can.	Toronto.	3.17	3.08	3.10	De. 30, Ja. 15	0.12½
Nipissing	N. Y. Curb.	6⅜	6	6	Ma.31,Ap.20 Q	0.15

Stock	Exch.	High	Low	Last		Last Div.
SILVER-LEAD						
Ahumada	New York	3⅛	3⅛	3⅛	Ma. 25,Ap.4,QX	0.12½
Bingham Mines	Boston	45⅛	44½	44⅝	Ma.21, Ap. 5 Q	1.00
Bunker Hill&Sullivan	N. Y. Curb	81¼	76¼	81	Ap.30,My.4 MX	0.75
Cardiff M. & M.	Salt Lake	*50	*38	*38	Feb. 5, 1927	0.10
Chief Consol.	Salt Lake	2.42½	2.37½	2.42½	Nov., 1926 Q	0.10
Consti'nMng.&Mill'g	Spokane	*32	*24	*29		
Erupcion	Boston Curb	*49	*48	*49	Ma. 25, Ap. 2 Q	0.07½
Eureka Lily	Salt Lake	1.52½	1.45	1.45		
Federal M. & S.	New York	137	134½	134½		
Federal M. & S. pfd.	New York	97	94¾	95¼	My.25, Ju.15 Q	1.75
Hawthorne Mines	N. Y. Curb	*4	*2	*3		
Hecla Mining	N. Y. Curb	14¼	14	14¼	My.4, Ju. 15 Q	0.25
Highland-Surprise	Spokane	8.25	8.00	8.00		
Iron King Mining	Salt Lake	*48	*45	*45		
Keystone Mining	Salt Lake			*30	Au. 12, Au. 26	0.07½
Lucky Jim	Spokane	*20⅜	*20⅛	*20⅜		
Lucky Tiger-Com.	Kansas City	†6½	†6½		My. 10, My. 20	0.05
Mammoth Mining	Salt Lake	1.92½	1.92½	1.92½	De. 17,De.23 Q	0.25
Marsh Mines	Spokane	1⅛	1	1		
North Lily	Salt Lake	3.47½	3.20	3.20		
Park Utah	New York	7	6⅜	7	Jn. 25, Jy. 1 Q	0.20
Plutus Mining	Salt Lake	1.85	1.80	1.80	Ja. 10, Ja. 15 Q	0.10
San Rafael	San Francisco			*24		
Silver King Coal	Salt Lake	7.75	7.60	7.60	Ma. 21, Ap. 1 Q	0.25
Silversmith	Spokane	*36	*35	*36	Oct., 1926 Q	0.02½
Stratton Mines	Spokane	*45	*41	*43⅜		
Sunshine M. Co.	Spokane	*90	*79⅛	*90		
Tamarack-Custer	Spokane	*28	*26½	*26½	Sept., 1924	0.25
Tintic Standard	Salt Lake	11.00	10.75	10.87½	Ma.16, Ma.29 X	0.40
Utah-Apex	Boston	5¼	5	5	Oct., 1926	0.25
IRON						
Bethlehem Steel	New York	51⅞	49¾	50¾	July, 1924	1.25
Cleveland-Cliffs Iron	Cleveland	78	77⅞	77⅞	Ja. 15, Ja. 25 Q	1.00
Colorado Fuel & Iron	New York	91	86	87½	May, 1921	0.75
Gt. North'n Iron Ore	New York	20⅜	19⅜	19½	Dec. 6, Dec. 28	0.75
Inland Steel	New York	47¾	45	46	My. 13, Jn. 1 Q	0.62½
Replogle Steel	New York	13½	10⅜	12½		
Republic I. & S.	New York	69	66	67	My. 14, Jn. 1 Q	1.00
Republic I. & S. pfd.	New York	106	104½	106	Jn. 14, Jy. 1 Q	1.75
Sloss-Sheffield S. & I.	New York	131	128½	130	Jn. 10, Ju. 20 Q	1.50
Sloss-Shef. S.&I. pfd.	New York	107	106	107	Jn. 20, Jy. 1 Q	1.75
U. S. Steel	New York	174¼	172	173¾	Jn. 7, Jn. 29 Q	1.75
U. S. Steel, pfd.	New York	133¼	132¼	132½	My.2, My.28 Q	1.75
Virginia I. C. & C.	New York	48	48	48	Jan., 1924	1.50
Virginia I.C.&C. pfd.	New York			60½	Ju. 15, Jy. 1	2.50
DIAMONDS, PLATINUM, ALUMINUM. VANADIUM, TIN						
De Beers Consol.	New York			30⅛	Ja. 26, Ja. 29	1.45
So. Am. G. & P. New.	N. Y. Curb	109⅛	109⅛	109⅝		
Alum. Co. of Amer.	N. Y. Curb	68⅛	68	68		
Alum. Co. of Amer.pf	N. Y. Curb	103⅜	103⅛	103⅜	Ma. 15, Ap. 1 Q	1.50
Vanadium Corp.	New York	47⅜	45	45	My. 2, My. 16Q	0.75
Patino M. & E.	New York	23	22	22	Ap. 27, My. 5	1 sh.
ASBESTOS						
Asbestos Corp.	Montreal	24	20	23⅛	Jan., 1926	1.50
Asbestos Corp. pfd.	Montreal	87⅛	85⅛	87⅛	Ma.31, Ap.15 Q	1.75
SULPHUR						
Freeport, Texas	New York	68⅛	65⅞	67⅛	Ap. 15, My. 2 Q	1.00
Texas Gulf	New York	60⅜	57⅛	60⅛	Ju. 1, Ju. 15 Q	1.00
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	42⅞	41⅜	41⅜	My. 20, Ju. 1Q	0.75
Amer. Metal, pfd.	New York			112½	My. 21, Ju. 1Q	1.75
Amer. Sm. & Ref.	New York	161⅛	158¼	159½	Ap.14, My.2 Q	2.00
Amer. Sm. & Ref. pfd.	New York	125¼	124¾	125	My. 6, Jn. 1 Q	1.75
Consol. M. & S.	Montreal	253½	245½	246	De.31, Ja. 15 X	6.25
Federated Metals	N. Y. Curb	11⅜	10	10		
Newmont Mining	N. Y. Curb	74⅛	73	73	Ma.31, Ap.15 Q	0.60
U. S. Sm. R. & M.	New York	37	36	36½	Ap. 7, Ap. 15 Q	0.87½
U.S. Sm. R.&M. pfd.	New York	48⅜	48⅞	48	Ap. 7, Ap. 15 Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. S/, Semi-annually. M, Monthly. F, four weeks. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

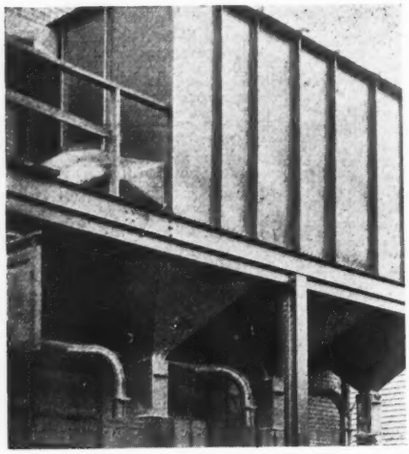
Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

LONDON QUOTATIONS—WEEK ENDED May 17, 1927

Name	High	Low	Last	Date	Last Div. Amount
Aramayo Mines (25 frs.)	90/—	87/6	88/9	May, 1927	5 p.c. (†)
British Platinum (£1)	3/3	3/—	3/—	Feb., 1925	2½ p.c.
Burma Corpn. (10 rupees)	15/9	14/10½	15/1½	Feb., 1927	6 annas*
Bwana M'Kubwa (5s)	6/1½	5/9	5/10½		
Camp Bird (2s)	4/4½	4/—	4/3		
El Oro (£1)	4/3	4/—	4/3	Nov., 1924	2½ p.c.*
Esperanza (10s)	—/1½	—/1½	—/1½		
Frontino & Bolivia (£1)	13/—	12/6	12/6	Jan., 1927	5 p.c.
Mexican Corpn. (£1)	11/3	9/9	10/9		
Mexico Mines of El Oro (£1)	19/4½	16/3	17/6	Dec., 1926	3¾ p.c.*
N'Changa Copper Mining	13/9	12/3	13/—		
Oroville Dredging (£1)	6/6	6/4½	6/6	Dec., 1923	3¾ p.c.
Ouro Preto (£1)	2/—	1/9	2/—	May, 1925	2½ p.c.
Rhodesian Congo Border (£1)	59/4½	53/9	57/6		
St. John del Rey (£1)	13/—	12/—	12/9	May, 1927	3¾ p.c.
San Francisco Mines (10s)	33/4½	32/4½	32/6	Jan., 1927	25s.
Santa Gertrudis (£1)	17/1½	15/10½	16/1½	Jan., 1927	3¾ p.c.
Selukwe (2s. 6d.)	9/9	8/10½	9/3	April, 1917	6¼ p.c.
S. Amer. Copper (2s.)	3/3	3/—	3/3	Nov., 1917	75 p.c.
Tanganyika (£1)	68/6	50/—	51/10½	Aug., 1926	7½ p.c.
Union Miniere du Haut-Katanga (Brussels)	10.190	9.000	9,000	July, 1926	175 (‡)

* Free of British income tax. † Swiss frs. ‡ Belgian frs. and free of taxation.

New Machinery and Inventions



Improved construction prevents air leakage in this dust collector

Cloth Screen Dust Collector

New features have recently been incorporated in all Norblo dust-collecting equipment manufactured by the Northern Blower Co., Cleveland, Ohio.

The cloth screens in these dust collectors not only are stretched on wooden frames and heavily reinforced across the filtering area by steel braces and wires, but are stacked closely together; and the air, after the heavier suspended particles have been released by impact upon the baffle plates in front of the dusty air inlet, passes between the screens, through the fabric, and thence to the clean air chamber at the top.

The air baffle plates extend along the entire length of the dusty air chamber, and the dividing compartment that separates the latter from the clean air chamber has a walk-way or platform on its upper surface, which greatly facilitates inspection and maintenance.

To insure a thoroughly air-tight joint along the edge of the cloth, the wooden frame is provided with a deep groove into which the cloth is forced, and a superimposed layer of heavy cord and a series of nails at close intervals hold the cord and the cloth securely in position. All air leakage between the separate screens themselves is prevented by intervening wooden spacing strips alternately grooved and tongued, and packed with cloth on both sides. Air vents are made on both sides of each screen to provide ample air volume so as to keep the air velocity at a minimum.

New High-Low Water Alarm Signal Panel

A new General Electric signal panel, the CR-4779-A-1, has been designed for use in pump installations—especially in buildings—as a warning signal for the purpose of calling an attendant in case of danger from overflow or emptying of the tank. The panel is governed by one or two float switches. With this panel an audible signal sounds immediately when either the predetermined high or low level of water is reached.

Magnetic-Vane Principle Used in New Relays

A new line of direct-current relays, filling an important place in this field, has been developed by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

This new X line, which includes resistance-measuring, over-current voltage, polarized and relays of other types, closely resembles the Westinghouse induction-type alternating-current line of relays, and occupies about the same amount of switchboard space.

In the operation of the new relays, which is on the magnetic-vane principle, it is possible, according to the manufacturer, to determine their operating values of current or voltage and their time of operation with a great degree of accuracy.

The resistance-measuring relay Type XM has been developed for automatic service-restoring circuit-breakers and actually measures the resistance of the feeder.

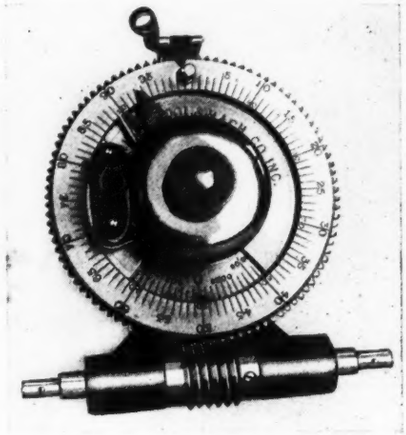
A particular feature of the XM relay is its time limit, which prevents the breaker from pumping rapidly when the trouble is of a recurring nature. This new line of relays is particularly useful in automatic substations.

A resistance-measuring relay that is useful in automatic substations

Revolution Stop Counter Has Original Features

Marketing of a revolution stop counter involving several original design features has been announced by the Viking Tool & Machine Co., Inc., 745-759 Sixty-fifth St., Brooklyn, N. Y. This counter is for use in automatically stopping a machine after a predetermined number of revolutions, ranging from 1 to 9,750, have been made. The device is particularly applicable to various types of coil-winding machines where a fixed number of turns are to be wound, for linear measuring machines, power presses, screw machines where a limited production is required, chemical mixing machines, and textile and printing machinery.

Three styles of counters are made, of which the electrical-contact type is illustrated. Stopping of a machine is accomplished by a make-and-break electrical contact that operates a suitable relay. A second type of counter is equipped with a mechanically operated plunger that operates the clutch for stopping the machine. The third style is a plain counter, by means of which the number of revolutions or strokes made by a machine can readily be determined by observation. This style of counter is limited to 9,900 revolutions; however, by means of suitable gearing between the device and the rotating member, any reasonable number of revolutions above this can be counted.



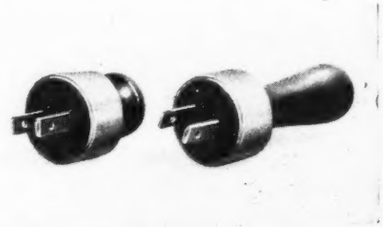
Electric-contact type of revolution counter with automatic stop

The device consists essentially of a driving worm and a split wormwheel consisting of two disks. There are 100 wormwheel teeth on the periphery of the outside disk, and 99 teeth on the inside disk. The two disks are mounted on a single stud, and for every 100 revolutions of the worm the rear disk advances one one-hundredth of a division over the front disk. This central stud also carries a lever for setting the predetermined number of revolutions and for engaging a trip.

Handle Cap Plugs

Marketing of two new designs of handle cap plugs has been announced by the Beaver Machine & Tool Co., Inc., 625 North Third St., Newark, N. J. These cap plugs, which differ only in the length of the handle and are shown in the illustration, are designed to replace the ordinary caps on small portable electrical equipment such as drills, gluepots, and so on.

The handle, which is hollow to receive the cord, is made of wood and the terminals are mounted on a molded composition base. This base is protected at the end by a nickel-plated ferrule, which also serves to hold the base and handle firmly together.



Handle cap plugs for portable electrical equipment